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15 June 1982

# Worldwide Report

ENVIRONMENTAL QUALITY

No. 357

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15 June 1982

# WORLDWIDE REPORT

## ENVIRONMENTAL QUALITY

No. 357

### CONTENTS

#### ASIA

#### AUSTRALIA

Gippsland Area Said to Show Effects of Pesticide Spraying (Stephen Foley; THE AGE, 24 Apr 82) .....	1
Lax Laws Allow Importation of Dangerous Pesticides (Peter Ellingsen; THE AGE, 27 Apr 82) .....	5
Health Risk Seen in Sewage Pollution of Sea Off SA Coast (Peter Blunden; THE AUSTRALIAN, 21 Apr 82) .....	7
Compulsory Registration of All Hazardous Waste Proposed (THE AGE, 30 Apr 82; THE COURIER-MAIL, 30 Apr 82; THE WEST AUSTRALIAN, 30 Apr 82) .....	8
House Committee Report, by Simon Balderstone Radioactive Tailings Suit, by Dierdre Macken Criticism of Facility, by Wallace Brown Perth Situation, by Trevor Gilmour	
Oil Spills Threaten Ecosystem in Botany Bay Area (Michele Ferguson; THE AUSTRALIAN, 22 Apr 82) .....	16
Voter Write-In Against Rainforest Logging Analyzed (Joseph Glascott; THE SYDNEY MORNING HERALD, 20 Apr 82)...	17
Government Asked To Act on Toxic Waste Dumping in Creeks (THE COURIER-MAIL, 20 Apr 82) .....	18
Briefs	
Breast Milk Contamination	19
Soil Abuse Penalties	19
Soil Conservation Funds	19
Water Misuse Damage	20

## NEW ZEALAND

Christchurch Plans Campaign to Reduce Air Pollution (THE PRESS, 30 Apr 82) .....	21
---	----

### Briefs

Lead Poisoning Research Urged	22
-------------------------------	----

## PHILIPPINES

Factories Pollute Ilog Banadero River (E. T. Suarez; BULLETIN TODAY, 17 May 82) .....	23
--	----

## SRI LANKA

Committee on West Coast Erosion Established (DAILY NEWS, 12 May 82) .....	24
--	----

## EAST EUROPE

## ALBANIA

Pollution From Industrial, Agricultural Units (Faik Toska; ZERI I POPULLIT, 12 May 82) .....	25
---	----

## MEXICO

### Briefs

Volcano Deaths Total 98	27
-------------------------	----

## NEAR EAST AND NORTH AFRICA

## PERSIAN GULF AFFAIRS

Air, Water Pollution Measures (Philip Moore; GULF MIRROR, 24 Apr 82) .....	28
---	----

## BAHRAIN

### Briefs

Possibility of Rationing Water	29
--------------------------------	----

## ISRAEL

Palestinian Study Offers Various Statistics on West Bank Water Use (SHU'UN FALASTINIYAH, May 82) .....	30
---	----

## SUB-SAHARAN AFRICA

### BOTSWANA

Drought Kills Crops, Cattle, Economy Ruined (THE CITIZEN, 24 May 82) .....	60
---	----

### GHANA

Water Level Drops in Volta Lake (Elvis D. Aryeh; DAILY GRAPHIC, 3 May 82) .....	62
--	----

### SOUTH AFRICA

Briefs Lesotho Water to South Africa	63
---	----

## WEST EUROPE

### INTERNATIONAL AFFAIRS

Swedish Study: Sulfur Emissions Harming Central Europe (Bo. B. Melander; DAGENS NYHETER, 18 May 82) .....	64
--	----

### BELGIUM

Belgium Has Worst Ecology Record in EEC (LE SOIR, 28 Apr 82) .....	66
---	----

### GREECE

Governmental Antipollution Measures Deemed Inadequate (EPIKAIRA, 20 May 82) .....	68
--	----

Drastic Measures Taken to Reduce Pollution (TA NEA, 12 May 82) .....	69
---	----

Briefs Rain, Hail Pelt Grevena	71
-----------------------------------	----

### UNITED KINGDOM

Briefs Research on 'Acid Rain' Halted	72
--	----

GIPPSLAND AREA SAID TO SHOW EFFECTS OF PESTICIDE SPRAYING

Strange Deaths of Five

Melbourne THE AGE in English 24 Apr 82 pp 1, 4

[Article by Stephen Foley]

[Excerpts] Five Victorian Lands Department workmen involved in the extensive spraying of herbicides in Gippsland have died from cancer or sudden heart attacks in the past three years.

About six other spray workers who suffered serious illnesses have received compensation from the State Government.

Lawyers for the Australian Workers' Union believe all the cases are linked to the chemicals 2,4,5-T and 2,4-D--the ingredients of the defoliant Agent Orange used in Vietnam. The chemicals are among the herbicides used by the Lands Department for the past 30 years.

An AWU official in Sale, Mr David Farrar, said: "We cannot say conclusively that they are poison-related, but there are problems when perfectly healthy guys suddenly keel over."

The new Minister for Forests and Lands, Mr Mackenzie, said yesterday that he was very concerned to learn of the workmen's deaths, and would investigate the matter.

He said he had always been opposed to the use of herbicides, and foreshadowed moves to stop or curb their use in Victoria. "It has been my attitude on the information I have obtained that there is enough doubt there to stop the use of herbicides until such time they are proven perfectly safe."

He said he hoped to discuss with his department officers soon the feasibility of ceasing herbicide use. "The ALP policy is to stop the use of it, and it is my intention to adhere to Labor Party policy," he said.

Mr MacKenzie said he wanted controls over both Government and private use of 2,4,5-T and 2,4-D and the promotion of alternative ways of combating noxious weeds. "I have serious concerns about the indiscriminate use of herbicides," he said. "I am concerned that they are given to people not experienced in their use, who may be using them in the air streams."

He would consider providing more money to the Keith Turnbull Research Institute to further research an alternative to herbicides. The institute is experimenting with biological methods of controlling weeds and blackberries.

Illnesses among about six Lands Department employees exposed to the sprays have been the subject of compensation claims. According to the AWU's solicitor, Mr Michael Arnold, all but one of the cases was settled out of court. Therefore there was no Workers' Compensation Board ruling on the cause of illness.

"In each case the Lands Department made a denial of liability, but they agreed to pay medical expenses and lost wages," he said.

Mr Arnold said both sides retained the right to pursue the claim further if the employee's condition grew more serious.

- The Lands Department makes special payment to those engaged in herbicide spraying. Workers directly exposed to the spray receive an extra 33 cents an hour while those working nearby get 27 cents an hour. According to

union officials it is "danger money".

- A State Liberal Government ban on the use of 2,4,5-T near built-up areas after a controversy over cluster birth deformities in the Yarram area in the mid-1970s is still in force.

However, the Vermin and Noxious Weeds Destruction Board, the chemical spray arm of the Lands Department, said it had no control over the herbicides it sold to private land owners. A board member, Dr William Parsons, said sales of 2,4,5-T and 2,4-D were worth about \$1 million to the department last year.

- The drift from heavy spraying of herbicides is blamed for the defoliation and deaths of trees, and for stock deformities, in a valley near Yarram.

- Figures released by the Lands Department on Ministerial authority show that in its chemical spray programme last year the department used 18,000 kilograms of 2,4,5-T and 35,000 kilograms of 2,4-D. In the same period the department sold 21,500 kilograms of 2,4,5-T and 128,000 kilograms of 2,4-D to the public.

### 'Vietnam-Like' Wasteland

Melbourne THE AGE in English 26 Apr 82 pp 1, 15

[Article by Stephen Foley]

[Excerpts]

A welcoming sign at the gateway to Yarram, in the butter and cream belt of Gippsland, boasts of the district's unspoiled charm.

But not far away, across the thick pine forests, lies the secluded Hiawatha Valley where other signs show that all is not well — dead trees, dying vegetation and an absence of bird life.

For more than 20 years the Lands Department has conducted a programme of herbicide spraying in Hiawatha Valley, using, among other chemicals, 2,4,5-T and 2,4-D, components of the military defoliant Agent Orange.

As a result of the spraying, residents claim a picture book setting in the Strzeleckis has become a microcosm of what took place in South Vietnam.

The spraying has continued here, as in other parts of the State, in an attempt to control blackberries and weeds such as ragwort.

Around Yarram, which was at the centre of a birth deformity scare four years ago, the controversy has been renewed by a small group of women who say the drift from continued spraying is destroying their haven in the mountains.

They claim the volume of chemicals poured on to Crown Land bordering their properties has defoliated and killed trees and taken its toll of stock.

Some of the cattle grazing in the area suffer deformities and owners say that abnormally high numbers of stock have had to be destroyed due to paralysis and unexplained sickness.

A former resident of the valley, Mrs Joan Osborne, speaks of the time when the birds made a din in the trees outside her bedroom window each morning.

Today, the two towering trees that shaded their old farmhouse are stark skeletons.

And the willows are nowhere to be seen. Now they are no more than images in Mrs Osborne's old snapshots.

Another resident in Hiawatha Valley, Miss Rene Woollard, is a fiercely independent and, to her detractors, somewhat eccentric spinster. She led the way to her tangled garden and pointed to the exaggerated growth of a mahogany gum.

Its branches were splayed and contorted.

Next to it, the top half of an English yew was dying.

Miss Woollard reached up and picked a handful of sickly leaves, crinkling at the edges. She indicated several brown spots: "That's where it was hit by the drift. It is funnelled into this valley by the air currents — it's completely uncontrollable," she said.

'Miss Woollard's three-roomed home sits half-way up the slopes of the valley, obscured from the road by a tangle of blackberries.

She has been an indefatigable fighter for the abolition of herbicides for 15 years, a stand which she says has isolated her from much of the farming community.

"People refer to me as 'that silly old duck up in the mountains' but I'm not afraid," she said.

Miss Woollard, whose farm upbringing taught her to be cautious with all poisons, became concerned about chemical sprays when she saw the effect it was having on her sheep and cattle.

It's all written down in an old

ledger book: the spastic calves, the 15 cows she had shot by a neighbor because of calving paralysis, the deformities too distasteful to mention.

However, Dr Bill Parsons, a member of the Vermin and Noxious Weeds Destruction Board, who has visited the valley, said: "There's no way the drift from those phenoxy herbicides would kill those trees.

Joan Osborne said that when her family first settled at Stacey's Bridge, the Lands Department threatened to prosecute farmers if they did not spray with 2,4,5-T or 2,4-D.

But after using Lands Department equipment to spray grass on their property, the Osbornes became suspicious when their cows did not become pregnant.

In their last winter at the farm, they lost 100 of their dairy herd. The cows suddenly contracted an unknown illness.

Both Miss Woollard and Mrs Osborne said 2,4,5-T and 2,4-D were often mixed far stronger than recommended.

"It was left to unskilled people who just swished it around as if it was water," Miss Woollard said.

Mrs Osborne added: "The Crown Land at the back of our home must have been sprayed as strongly as Vietnam to defoliate and kill the huge gums."

The irony was that throughout the spraying campaigns, year in, year out, the ragwort continued to grow.

Between 1975 and 1976, a number of babies were born with

major deformities soon after the Yarram district had been sprayed from the air with 2,4,5-T and 2,4-D. The babies died. Two doctors found that the frequency of neural tube disorders was 10 times the world rate. They found the Yarram abnormality rate among living children was at least twice the national average.

In March, 1978, following a controversy over the deformities, the then Minister for Health, Mr Houghton, announced an inquiry which found no evidence linking the birth defects and herbicides spraying.

But scientists and doctors who took a close interest in the inquiry criticised it for a lack of thoroughness. The report said the malformations did not suggest a specific local cause. It also said that three abnormal babies among 93 deliveries at Yarram was a one in 500 probability which could happen by chance.

An ACTU-Trades Hall Council occupational health and safety unit report on the use of 2,4,5-T and 2,4-D, released last year said:

"It is necessary to point out that the data analysed in the Yarram Report are mortality rather than incidence data. There is, as yet, no systematic collection of incidence data on such abnormalities throughout Australia.

"Further, as the majority of malformed fetuses are aborted, spontaneous abortions must be considered simultaneously with the numbers of live-born malformed children if credible judgements are to be made. The Yarram Report fails to recognise the importance of abortion information and consequently exempts it from analyses and conclusions."



## Opposition to Ban

Melbourne THE AGE in English 26 Apr 82 p 15

[Article by Paul Chadwick]

[Excerpts]

Farmers and the chemical industry will fiercely oppose moves by the Victorian Government to end the use of some herbicides.

Bans on the chemicals 2,4,5-T and 2,4-D would cost agriculture tens of millions of dollars in lost production, the president of the pastoral division of the Victorian Farmers and Graziers Union, Mr Des Crowe, said yesterday.

All primary products would be affected, but grain would be worst hit, he said. There could be shortages of some grain-based products on the domestic market and there would be a drop in export earnings, he said.

Mr Crowe was commenting on a report that the Minister for Forests and Lands, Mr Mackenzie, planned to discuss with his department's officers the feasibility of ceasing the use of the herbicides.

Statistics about the extent of pesticide use in Australia are imprecise and scarce. A Federal Government report last year estimated that between 2000 and 3000 tonnes of 2,4-D were used annually "in a wide variety of formulations to cater for the widely different uses".

The Commonwealth pesticides co-ordinator, Mr Jack Snelson, said yesterday that herbicides were worth about \$100 million a year to retailers and about \$500 million a year to users in the improved yields that followed pest control. Australian States were unanimous "that there are no reasons whatsoever to restrict the use of 2,4-D and 2,4,5-T" from a scientific and administrative point of view, he said.

The Victorian Lands Department alone has been estimated to sell about \$1 million worth of chemicals to private users each year.

CSO: 5000/7541

LAX LAWS ALLOW IMPORTATION OF DANGEROUS PESTICIDES

Melbourne THE AGE in English 27 Apr 82 pp 1, 3

[Article by Peter Ellingsen]

[Text] Inadequate Federal laws mean smugglers can import dangerous chemical pesticides from abroad to the NT and the ACT, then ship them into the States, where they are prohibited.

In the six States, a pesticide must be registered with the State Department of Agriculture before it can be used. But in the Northern Territory and the ACT, there is no requirement for registration under their Federal laws.

People can bring the prohibited pesticides into Australia legally through the NT or the ACT, then run them across the borders into the States.

In at least one case, it is known that a pesticide prohibited by the States was imported through Darwin and used, illegally, to control insects in another State. One expert in the field has given THE AGE details of the case.

Experts say the prohibited chemicals are considered too dangerous to be used and are banned in many developed countries.

According to a letter written earlier this month by the secretary of the Premier's Department, Mr Ken Green, the Prime Minister, Mr Fraser, is concerned about the loophole and is working to have it closed. The chief of Victoria's agricultural chemistry division, Mr Bob Belcher, is also trying to have the matter rectified.

"I have made very strong representations to get this loophole closed," he said. Mr Belcher said allegations had been made that prohibited pesticides were being landed in Darwin then shipped to Victoria, where they were being used illegally. He said he had not yet been able to substantiate these claims.

According to the Commonwealth coordinator of pesticides, Mr Jack Snelson, the loophole is not being widely exploited. "It happens so seldom," he said.

Mr Snelson said he had been waiting for eight years to have registration of pesticides made mandatory in the territories.

The loophole is just one of several weaknesses in Federal and State attempts to control dangerous pesticides and herbicides.

According to Mr Peter Rawlinson, senior lecturer in zoology at La Trobe University, legislative safeguards, particularly in regard to aerial spraying, are ineffective.

"Controls on aerial spraying as far as public health is concerned are non-existent," he said. "The only checks that are there are to protect the agriculture."

Mr Belcher agrees. "There is no doubt the original act is designed to protect agriculture, not people, from certain herbicides," he said. "I would like to see stronger controls on agricultural chemicals."

It is not only farms that get sprayed. A crowd at the Leongatha drive-in was sprayed with a fungicide in January 1979. According to Mr Rawlinson, the 200 patrons complained of irritation to the eyes, ears and nose but the pilot had not breached the Aerial Spraying Control Act and so no charges could be laid.

"While it is illegal to spray 2,4-D or 2,4,5-T within eight kilometres of a susceptible crop, it is legal to spray immediately adjacent to houses and towns," he said. "Accidental or deliberate spraying of human habitation does not constitute an offence under the act."

Last year a Gippsland farming family was accidentally sprayed with 2,4-D and family members now claim to have recorded levels of the herbicide in their blood and urine.

The family does not wish to be identified because of the controversy surrounding aerial spraying of herbicides, and the strong emotions it raises in farming communities. "It is a volatile question here--a lot of people feel spraying is necessary to maintain an economic farm," one of the family said.

According to Mr Rawlinson, tests in Sweden, Canada and the US have established a link between exposure to 2,4-D and 2,4,5-T and a high incidence of soft-tissue cancer.

He said the common practice of low-volume spraying in Victoria, where the herbicides are used in a highly concentrated form, only increased the risk to health.

The deputy director-general of agriculture, Mr Bob Taylor, says there have been problems with aerial spraying, but believes these can be overcome by self-regulation. "There have been mistakes, but the public is now putting a lot of pressure on the industry," he said.

CSO: 5000/7542

# HEALTH RISK SEEN IN SEWAGE POLLUTION OF SEA OFF SA COAST

Canberra THE AUSTRALIAN in English 21 Apr 82 p 3

[Article by Peter Blunden]

[Text]

A MAJOR health risk was posed by a strike which had caused millions of gallons of raw sewage to be poured into the sea off Adelaide, the South Australian Government warned yesterday.

Concern centres on pollution in the Gulf of St Vincent and on the simultaneous severing of power supplies to laboratories monitoring dangerous bacteria in the State's water supplies.

The Government confirmed yesterday that the State Water Laboratories were no longer able to test for the deadly organism responsible for amoebic meningitis - a water-borne disease that killed a 10-year-old boy at Whyalla early last year.

The Minister of Water Resources, Mr Arnold, said the health of thousands of people in the north of the State was at risk.

"The incubation temperatures needed to isolate the deadly organism can not be maintained at the laboratories," Mr Arnold said.

## MEETING

He also warned people to stay clear of the sewage discharge area, behind Torrens Island, north of Adelaide.

The strike by sewage workers - members of the Federated Engine Drivers and Fire-

mens Association - has shut down the Bolivar Treatment Werks, north of Adelaide, and resulted in millions of gallons of raw sewage flowing into the gulf.

Mr Arnold last night attacked the strikers for their "unwarranted and irresponsible action".

An urgent meeting was convened late yesterday by the Public Service Board in an effort to resolve the dispute over improved conditions.

At the same time, the Department of Water Resources is continuing efforts to carry out a limited program of testing for bacteria in water supplies.

The sewage discharge has also seriously alarmed fishermen, and the State's Department of Fisheries was late yesterday examining the situation.

Mr Arnold said a federal package of wages and conditions had already been agreed to by the union for all FEDFA employees in State employ.

"This agreement provided for no extra claims for 12 months, but operators at Bolivar made extra claims," he said.

"When these were refused, the operators walked off the job."

The dispute could delay ratification of the agreement by the Full Bench of the Arbitration and Conciliation Commission, and thereby disadvantage other union members, Mr Arnold said.

COMPULSORY REGISTRATION OF ALL HAZARDOUS WASTE PROPOSED

House Committee Report

Melbourne THE AGE in English 30 Apr 82 p 3

[Article by Simon Balderstone: "Report Slams Waste Disposal"]

[Text] Canberra.--The storage, transport and disposal of millions of litres of hazardous chemical wastes is generally unregulated and often unsafe, according to the House of Representatives standing committee on environment and conservation.

The committee recommended that if State Governments failed to introduce effective waste disposal strategies by 1985, the Commonwealth should legislate to control hazardous wastes "to the fullest extent of its power."

It also recommended that if the State Governments failed to incorporate the Australian Code for the Transport of Dangerous Goods by Road and Rail into legislation by 1985, the Commonwealth should legislate to enforce it too.

The committee found that incidents involving improper disposal of hazardous wastes included:

--Drums of waste illegally dump-on non-municipal tips had exploded, killing or injuring tip workers and damaging machinery.

--Several hundred badly corroded drums of combustible waste were used for traffic barriers at a drive-in cinema in outer Melbourne.

--Oil contaminated with polychlorinated biphenyls disposed of on-site by a junkyard found its way into Edwardes Park Lake, Reservoir. The lake contains very high residue levels of polychlorinated biphenyls, particularly in the sediments.

The committee found that the present regulation of hazardous, long-life radioactive waste was inadequate. In New South Wales and Western Australia, there had been recent discoveries of radioactive waste from sandmining being improperly disposed. Houses, schools and shops had been built on top of the waste.

The chairman of the committee, Mr Hodges (Lib, Qld), said that despite the fact that the radioactivity of the waste had been known of for a long time, the lack of effective control over its disposal had resulted in individuals being "unnecessarily and insidiously exposed for considerable periods."

The committee also found that arrangements within and between the States for disposal of chemical wastes was fragmented and lacked uniformity. "At the Commonwealth level, the situation is no better," he said.

"Several Commonwealth departments and authorities approached by the committee were unaware of their responsibilities concerning hazardous chemicals."

Mr Hodges said yesterday that much of the hazardous chemical waste produced in Australia was being dumped illegally. He said that during its inquiry into hazardous chemicals, the committee had been so alarmed by hazardous waste disposal practices in some States that it had decided to make a separate report on the adequacy of disposal facilities and procedures ahead of the main report.

Although New South Wales and Victoria had made considerable progress in providing regulations and facilities for the disposal of hazardous waste, "some other States behave as though these hazards do not exist," he said.

The bi-partisan committee was particularly critical of the Queensland Government, and said the official liquid waste disposal facility at Willawong, Brisbane, was a disaster.

Outside NSW and Victoria, basic information was lacking on the types and quantities of hazardous waste being generated. "As such information is the starting point for attacking the problem, the outlook for most States, in the short-term, is bleak," Mr Hodges said.

A member of the committee, the Opposition spokesman on environment and conservation, Mr West, said Australia had been lucky not to have experienced an environmental disaster such as that at Love Canal, near Niagara Falls, where toxic wastes dumped into an abandoned canal had led to large numbers of miscarriages, birth defects, respiratory problems and nervous breakdowns among people living near the dump, and the eventual evacuation of 239 people.

He said Australia had no compulsory controls over the introduction of chemicals for commercial and industrial use. Most State laws governing their use, transport and ultimate disposal were disparate and inadequate.

Another main recommendation of the committee was for the Commonwealth to seek the views of the States and the Northern Territory on the question of a single national incinerator. The committee said the Federal Government should approach the NSW Government to get national access to the high-temperature incinerator (for very toxic waste) in Sydney.

The committee found that:

--Chemical waste disposal facilities were generally inadequate or non-existent;

--A lot of hazardous waste was stored usually in steel drums on industrial sites, until satisfactory disposal methods were developed;

--There was a high probability that some material which should be stored was being improperly disposed of or illegally dumped.

--There had been an unnecessary build-up and storage of toxic waste. Waste for which there was an acceptable disposal method should not be stockpiled unnecessarily.

--Waste had been stockpiled for a number of years, and it was increasingly likely that some of these drums were corroding and would leak.

The committee recommended that the Department of Defence test ground and surface water flowing from World War II chemical weapon storage and disposal sites for the presence of chemical "leachgate."

Other recommendations included:

--Hazardous wastes which could be reprocessed economically were not to be used as land fill or incinerated unless required as a source of energy for incineration.

--The development of standards for the safety of waste disposal sites after closure, including appropriate future uses.

#### Radioactive Tailings Suit

Melbourne THE AGE in English 30 Apr 82 p 5

[Article by Dierdre Macken]

[Text]

SYDNEY. — The New South Wales Health Commission may consider legal action against a sand-mining company after an investigation which showed there were unacceptable radiation levels in 24 houses, part of a hospital, a public school, baby health care centre, and playing field at Byron Bay on the NSW north coast.

The commission will consider action to recover costs of cleaning up the area if the company does not meet them.

Previous tests in the Byron Bay area had shown that only a few houses, part of a school and some railway land were high in radioactivity, but recent tests have shown that the after-effects of sand mining are much more widespread.

The Director of Public Health, Dr Allen Crawford, will go to the area today to oversee a big excavation programme, which will involve demolishing at least one house and part of a hospital.

Already two areas of land have been cleared and a portable classroom removed so that the tailings from sand mining containing radioactive thorium could be removed.

The Health Commission has asked the company to clean up the tailings from 40 years of sand mining, but if the company, Associated Mineral Consolidated, is unwilling, the commission will consider taking legal action to recover the cost of cleaning up.

The NSW Minister for Health, Mr Brereton, said: "Measures should have been taken to guarantee that radioactive material

would not pose a danger to the public. Over the years sand mining companies have made considerable profit from their activities and I now believe they have a moral responsibility to resolve this problem.

"The company should guarantee that they will meet all the costs involved in this clean-up operation."

Associated Mineral Consolidated mined sands in the Byron Bay area from 1934 to 1975. Today the company will end all operations in Byron Bay to concentrate its mining operations in Western Australia.

The radioactivity arises from a sand product called mineral monazite, which contains radioactive thorium and which was dumped in the area of the town after the mining process had finished.

Mr Brereton said that of the 30

buildings contaminated by the radioactive material, some had two to three times the acceptable level of 0.1 millirems per house. Previous studies have shown some areas in the town have between four and 44 times the acceptable levels.

The removal of the contaminated tailings had already begun but the operation will be accelerated under the direction of Dr Crawford.

Last night, the Health Commission had not heard whether the company was prepared to pay the cost of excavating the 30 other sites and 'The Age' could not contact any executives of the company.

But Mr Brereton said: "If they are not willing to compensate the people affected then I will examine what means are available to ensure that they do."

#### Criticism of Facility

Brisbane THE COURIER-MAIL in English 30 Apr 82 p 3

[Article by Wallace Brown]

[Text] Canberra.--The disposal of hazardous chemical wastes in Brisbane is appalling and gives grave cause for concern, according to the House of Representatives standing committee on environment and conservation.

Both the Queensland Government and the Brisbane City Council are criticised in the committee's report, tabled in Parliament yesterday by its chairman, the deputy Liberal whip, Mr Hodges (Lib, Q.)

Mr Hodges said: "The situation at the Willawong disposal area (between the suburbs of Acacia Ridge and Inala) can only be described as a disaster."

The report says toxic wastes are escaping from the site into nearby creeks--one appropriately named Blunder Creek--which flow into the Brisbane River.

Evidence had been given to the committee that much of the waste would remain toxic for several hundred years.

The report says: "The committee was appalled by the Willawong operation and the continued lack of effective control by the state government and the city council.

"It is essential that effective waste disposal strategies be developed as a matter of urgency at the national level with the participation of state, territory and commonwealth governments.



"Proper disposal facilities alone are not the answer to the problem.

"A comprehensive strategy with adequate penalties to back it up is required to ensure wastes are safely handled at all stages from generation to disposal."

Mr Hodges said the committee had inspected landfill waste disposal facilities at Castlereagh in Sydney, Tullamarine in Melbourne, Canning in Perth, and Willawong.

He said: "While New South Wales and Victoria have made considerable progress in providing regulations and facilities for the disposal of hazardous wastes, some other states behave as though these hazards do not exist."

The opposition environment and conservation spokesman, Mr West, who is a member of the committee, told Parliament: I found the evidence at Willawong, as given by ex-employees and chemists, incredible and unbelievable.

The state government completely reneges its responsibilities to the Brisbane City Council and they attempt to carry out an operation which should be under the jurisdiction of either the State or Federal Government.

Major points made in the report about Willawong include:--

--The contract under which Willawong is operated for the Brisbane City Council prohibits the disposal of hazardous wastes at the plant but does not define what is meant by the term.

--Wastes that are unsuitable for the most well-controlled landfill, such as polychlorinated biphenyls (PCBs) and cyanids, are being dumped at Willawong.

--Their illnesses include kidney malfunction, blood disorders and possible liver disease.

--It would appear that some intractable wastes from outside Queensland have been taken there for easy disposal.

--Two distinct operations are conducted at Willawong to dispose of the estimated 27-36 million litres of liquid wastes received each year. In one, aqueous wastes are treated to remove solids and the remaining liquid spray-irrigated and evaporated.

--This method is used for approximately two-thirds (18-24 million litres a year) of the total liquid waste, an apparent hazard potential.

--In the other operation the other third of the total wastes (9-12 million litres a year), which is mainly nonaqueous, is buried in trenches. Most of this waste is hazardous and some is very hazardous.

--Hazardous liquids are put into trenches dug in ground comprising layers of sand and clay. The ground is retrenched after several months and after previous material has leached away.

--The ground into which the waste is poured has been used, between one and three years earlier, for nightsoil disposal.

--Hazardous wastes include oil, solvents, paint sludges, organic chemicals, thick animal and vegetable sludges, acids, alkalis and toxic industrial wastes.

--Disposal charges are set by the Brisbane City Council and are a quarter of the charges in Sydney and Melbourne. The revenue from these low disposal charges does not permit adequate treatment by the company operating the site.

--Largely because the owners of the disposal plant are industrial cleaners and waste carriers themselves, carriers delivering waste to the dump are unwilling to disclose the generators of, and therefore the nature of the waste.

--Willawong Liquid Waste Disposal Pty Ltd is owned by Berkeley Sanitation Services (51 percent) and Greasetrap Cleaning Service (49 percent) with Greasetrap Cleaning Service being the largest liquid waste-tanker operator in Brisbane.

--As there is limited knowledge of the nature of the waste dumped, little or no treatment is possible and near fatal incidents have occurred. Loads are often mixed, making treatment more difficult.

--The operators of Willawong were not aware, until informed by the committee, that waste from a battery factory, inspected earlier in the day by the committee, contained lead. They believed the waste to be just acid.

In Brisbane, the Lord Mayor, Alderman Harvey, said the problems of the Willawong dump had been well known for two years.

He said as soon as the council realised liquid wastes were seeping into nearby Blunder Creek, the Water Quality Control Council was advised.

Willawong would be closed as soon as possible. The council was doing everything it could to minimise the health risks.

He expected Willawong would reach its capacity by the end of this year.

Liquid wastes from local authorities throughout southeast Queensland and from as far away as Maryborough were dumped at Willawong.

"It is more of a regional problem than a council problem," he said.

The State Health Minister, Mr Austin, said last night he was satisfied department regulations governing the Willawong operation were satisfactory.

"It's easy for the Federal Government to criticise local authority operations, but all three levels of government need to be involved in what is a national problem of waste disposal," he said.

## Perth Situation

Perth THE WEST AUSTRALIAN in English 30 Apr 82 p 4

[Article by Trevor Gilmour]

[Text] Canberra: A major committee of the Federal Parliament has warned of a possible threat to public health in Perth resulting from contamination of ground water supplies by waste products.

The House of Representatives standing committee on environment and conservation expressed concern about the fate of waste liquids that escape from disposal sites in the metropolitan region.

"Should this leachate find its way into ground water used as part of Perth's water supply the costs to community health and the finding of suitable alternative water supplies would be considerable," it said.

The committee's report, tabled in Parliament yesterday, said that about half of Perth's water supply was drawn from ground-water sources.

New dumping sites were being examined to replace those near ground water pumping areas.

The committee was concerned that some waste-disposal sites were near housing areas and that many households used bore water on their gardens.

Several companies were allowed to discharge waste directly into the sea in the Kwinana-Cockburn Sound area.

The report said that Perth had no single waste-disposal site. Several local authorities and some companies operated land waste sites.

There was little or no control over chemical waste transport.

Some public disposal sites were not permanently manned. Even when they were, the gatemen could not easily verify that the wastes were what the driver claimed they were.

Chemicals and septic-tank wastes could be--and presumably were--being mixed.

### Licensing

Though public and private sites for the disposal of liquid wastes had to be licensed under the Rights in Water and Irrigation Act, no facilities were available for wastes not included in the licence system.

It was believed that such wastes were disposed of by landfill methods "by one means or another."

Controls over chemicals disposed to landfill were inadequate.

The committee carried out an inspection of the Canning City Council's liquid-waste disposal site as well as landfill centres in Sydney, Melbourne, and Brisbane during its two year inquiry.

Referring to the Perth situation, the committee said that the common approach of liquid-disposal sites in the city was to tip the waste into pounds and allow the liquid element to evaporate and percolate through the permeable ground, which was usually sandy.

If the deposited solids interfered with the soaking-away of liquids, the ponds were allowed to dry out and the solids scraped away to make the ground permeable again.

#### Inadequate

"The Canning facility is far from adequate as a present-day liquid chemical waste-disposal facility, despite the commendable efforts of the Canning council to reduce the adverse effects of the facility," the report said.

"It is a major burden for an individual council to shoulder in the absence of guaranteed uniformity with other council areas and lacking the financial and technical resources to build and operate the kinds of facility needed."

The report said a WA Health Department report in 1979 had noted that existing disposal methods could not continue and had called for either a processing plant or waste exchange.

When the committee [as published]

The report said a WA Government was carrying out a survey to identify a hazardous chemical-disposal site.

The State had recently proposed a single secure landfill site for solid hazardous waste and had received the backing of the WA Local Government Association.

The committee did not know of any firm proposals by the Government for a liquid-waste facility.

CSO: 5000/7542

# OIL SPILLS THREATEN ECOSYSTEM IN BOTANY BAY AREA

Canberra THE AUSTRALIAN in English 22 Apr 82 p 11

[Article by Michele Ferguson]

[Text]

A HABITAT for rare migratory birds — such as curlews, sandpipers, dodwits and dotterels — in Sydney's Botany Bay is in danger because of pollution from oil spills in the bay, scientists at Sydney University have claimed.

The scientists, Dr Bill Allaway and Dr Tony Larkum are concerned at the damage to the ecosystem from oil spills which have resulted in a serious die-back of mangroves along the southern shores of Botany Bay.

Dr Allaway has been studying the mangroves in the bay for several years and his concern is shared by Dr Larkum who has worked on seagrasses in the area.

They have called for an improvement in clean-up operations should spills occur again.

The scientists believe skimmers and booms should be used more for oil clean up operations. Skimmers are devices towed by boats that skim over the water scooping up the floating oil which is

then transferred to trucks on shore.

## RESERVE

They said the endangered area was Towra Point on Kurnell Peninsula. Last month 281 hectares of the land was zoned by the NSW Department of Planning and Environment for preservation as "the most important nature reserve in NSW."

The area is listed by the United Nations as part of the World Heritage as it is the habitat for birds migrating from the northern hemisphere. The birds — such as the grey-tailed tattler — fly from as far away as Siberia and Japan each year.

Mangroves provide one of the few high-tide roosting areas on Botany Bay where migratory birds can shelter in safety.

Dr Allaway, a senior lecturer in Botany in the School of Biological Sciences said the declaration of Towra Point as a nature reserve "doesn't help much if the effects of past pollution and the likely pollution from future oil spills ultimately destroy the area."

VOTER WRITE-IN AGAINST RAINFOREST LOGGING ANALYZED

Sydney THE SYDNEY MORNING HERALD in English 20 Apr 82 p 9

[Article by Joseph Glascott: "Drummoyne Voters Oppose Logging of Rainforests"]

[Text]

Drummoyne electors on Saturday strongly opposed logging in NSW rainforests. The overall write-in vote against logging was 24.9 per cent.

This vote was verified by scrutineers for the Total Environment Centre, and supported by Mr Terry Metherell, the State Opposition spokesman on transport.

The Total Environment Centre asked electors to write "no rain forest logging" on their ballot papers at the by-election.

Mr Bren Claridge, of the NSW Rain Forest Action Group of the Total Environment Centre, said yesterday the write-in vote was a spectacular result.

He said the vote ranged from 32.8 per cent at Abbotsford booth to 30.6 per cent at Drummoyne, and 27.6 per cent at Queens Road, Five Dock, down to 11 per cent at a small booth at Five Dock.

He said the vote had been counted by official scrutineers with scrutineering rights given by the Independent candidate, Mr Nick Jones.

Mr Metherell said that at the main booth at Drummoyne Public School the write-in vote totalled 24.7 per cent of the overall vote.

The interesting thing was that Liberal voters recorded a total vote of 25.9 per cent against Labor's 20.7 per cent.

Mr Metherell said yesterday: "This write-in vote against rainforest logging was very substantial.

"After the 'no dam' vote at the Lowe Federal by-election, it shows that conservation issues are very much in the minds of electors.

"A higher write-in vote by Liberals than Labor voters in Drummoyne indicates that Liberal voters are becoming more sensitive on conservation issues.

"The high anti-rainforest logging vote will be a factor in deciding Opposition policy when the Premier, Mr Wran, brings down the Government's rainforest policy."

CSO: 5000/7541

GOVERNMENT ASKED TO ACT ON TOXIC WASTE DUMPING IN CREEKS

Brisbane THE COURIER-MAIL in English 20 Apr 82 p 11

[Text]

**HIGHLY-TOXIC liquid wastes could be dumped in Brisbane creeks unless the State Government moved quickly, the Brisbane City Council health chairman, Alderman O'Sullivan, said yesterday.**

He said the council-controlled Willawong liquid waste dump would soon reach saturation point and probably would close before 1983.

Alderman O'Sullivan said the council was urging the government to speed up a two-year study it started last year into liquid waste treatment.

"What we are concerned about is if there is no alternative to Willawong when it closes," he said.

"People complain about dumps like Willawong but that is nothing compared to what would happen if there was no dump. Highly toxic and dangerous liquid waste would be dumped in creeks, stormwater drains and sewers," he said.

Alderman O'Sullivan said the problem was

not just the councils. It affected every local authority in south-east Queensland.

"The whole treatment of liquid wastes in this area has to be co-ordinated," he said.

"To dump that sort of waste you need soil with a very high clay content. It would be now very hard to find such an area inside Brisbane well away from residential areas."

He said the council was having little success with government.

Someone should be working on an alternative site to Willawong," he said.

"It is quite horrific to think what might happen if there is no dumping area for toxic liquid wastes. Indiscriminate dumping of these wastes could create severe health and environmental problems."

CSO: 5000/7541

BRIEFS

BREAST MILK CONTAMINATION--Samples of breast milk are being taken from West Australian mothers to determine the extent of contamination from pesticides used against termites. Dr Peter Hartmann, senior lecturer in biochemistry at the University of Western Australia, said yesterday previous studies had shown "quite high" levels of contamination in human breast milk. Two chemicals were shown to have risen to levels of concern and recently a new compound, heptachlor, was found to be present in breast milk. Dr Hartmann said this compound had been introduced not long before to protect houses against termites. Initially, it was thought the contamination had come from pesticides used for agricultural purposes and strict legislation was introduced in Western Australia to control their use. Dr Hartmann said it was found in 1980 that levels of contamination in breast milk taken from mothers in agricultural areas was lower than those in city mothers. [Text] [Canberra THE AUSTRALIAN in English 23 Apr 82 p 2]

SOIL ABUSE PENALTIES--Greatly increased penalties are included in proposed legislation to strengthen the Soil Conservation Act. The Minister for Mines, Mr Jones, told the Legislative Assembly that the Soil Conservation Amendment Bill dealt with overall land degradation rather than the more narrow concept of soil erosion. It included wind and water erosion, salinity, flooding and the removal or deterioration of vegetation. The current legislation had been a response to the wind erosion associated with the crop-fallow system that operated in the wheatbelt in the 1930s and 1940s and therefore did not cover the other problems. Mr Jones said that penalties under the Act had been increased to bring them more into line with the seriousness of the problem. [In some cases the fines have been increased from \$20 to \$500 and from \$100 to \$1000.] He said that the proposed legislation would change the name of the Act to the Soil and Land Conservation Act. The Soil Conservation Advisory Committee would now consist of 10 people, half of whom would be representatives of rural land users, Mr Jones said. Mr Jones said that a major aim of the Bill was to place the responsibility for soil conservation firmly on the communities involved. [Text] [Perth THE WEST AUSTRALIAN in English 23 Apr 82 p 23]

SOIL CONSERVATION FUNDS--The acting Minister for Agriculture, Mr Day, has announced approval for an additional \$1 million in the current financial year to be lent to land holders for soil conservation. This brings the loan money total for approved soil conservation programs to \$4.15 million. The extra allocation was welcomed by the NSW Livestock and Grain Producers Association which had sought an additional \$1.7 million for soil conservation and water resource funding. [Text] [Sydney THE SYDNEY MORNING HERALD in English 29 Apr 82 p 3]



WATER MISUSE DAMAGE--The Millstream environment has been damaged by water-draws on the aquifer despite Government denials, according to North Province MLC, Mr Peter Dowding. He said that the Minister for Water Resources, Mr Mensaros, could put up as many figures as he liked, but an on-site inspection clearly revealed significant environmental damage. Mr Dowding said he was concerned that having caused a substantial deterioration of parts of the Millstream, the Government was now turning its attention to the Harding River. "Already the Harding River pools have dried up and if a dam is constructed, the river will be dry for most of the time," he said. "The recreational and conservation areas in the Pilbara are small but important and the demand for water has to be balanced with the need to preserve these areas." Mr Dowding said it was not only the right, but the duty, of citizens of the area to point out the detrimental effects on the environment. He had presented to Parliament petitions seeking an inquiry into the water resources of the region. They had contained more than 300 signatures. Such an inquiry might be necessary to fully protect the fragile resources of the North, he said. [Text] [Perth THE WEST AUSTRALIAN in English 29 Apr 82 News of the North p 19]

CSO: 5000/7543

## CHRISTCHURCH PLANS CAMPAIGN TO REDUCE AIR POLLUTION

Christchurch THE PRESS in English 30 Apr 82 p 4

[Text]

More clean air zones in Christchurch would mean pressure on coal merchants to improve their coal, the Canterbury United Council's air pollution committee heard yesterday.

The Christchurch branch manager of the State Coal Department and president of the Canterbury Coal Merchants' Association, Mr W. M. Warren, said that State coal met the 0.5 per cent sulphur content required in clean air zones but there were less suitable coals "going in the back door." State Coal supplied about 75 per cent of the local domestic market.

Many private coal merchants considered that 1 per cent was an acceptable sulphur content for coal used in space heaters and open fires, he said. Some who were heavily involved in private mines were not going to stop selling coal with higher sulphur contents that was their "bread and butter."

### Campaign

About \$19,000 will be spent on a two-month advertising campaign to reduce air pollution this winter.

Based on the slogan, "Make your home a clean air zone," the first newspaper advertisements will appear next week to promote the use of electricity and other smokeless methods of home heating. Approved electric and solid fuel heating appli-

ances will also appear in shops with "clean air" tags.

The Christchurch Meteorological Office will tag air pollution forecasts on to its answer-telephone service from tomorrow. Information on weather patterns will be updated in the mornings and afternoons to predict the level of pollution on a four-point scale from "low" to "severe."

### Car exhausts

Government action to reduce car exhaust emissions will be sought from the Minister of Transport (Mr Gair).

The committee will invite Mr Gair to discuss the matter. Dr N. J. Peet, a lecturer in chemical engineering at Canterbury University, said that pilot studies had already showed that regular exhaust testing led to fuel savings and less air pollution. A Government committee in 1977 had recommended including carbon monoxide tests in warrant of fitness tests but so far there had been only a publicity campaign on the fuel saving advantages.

Lead levels in petrol was another worry for committee members, who voted to ask the Ministry of Energy (Mr Birch) for a progress report on plans to reduce the lead content of petrol processed at the Marsden Point oil refinery.

BRIEFS

LEAD POISONING RESEARCH URGED--PA Wellington--A plea for more research into the problem of lead poisoning has been made by the New Zealand Clean Air Society. Blood lead levels previously thought quite safe may cause lowered intelligence in children, as well as behaviour problems, the society says. New Zealand, with 0.84 grams per litre, has one of the highest petrol lead levels in the world. The society says that although the Health Department favoured the removal of lead, it did not consider it a health hazard, and ignored overseas evidence indicating it was. It quotes the British Chief Medical Officer of Health as saying that there was a strong likelihood that lead in petrol was permanently reducing the I.Q. of many British children. The level of lead in petrol is expected to be reduced to 0.459/g in mid-1985, when extensions to the Whangarei refinery are completed, but the society says this is "too little, too late." By removing lead at its source, New Zealand may significantly reduce one of the most toxic and widespread pollutants from the environment, the society says. [Christchurch THE PRESS in English 4 May 82 p 4]

CSO: 5000/9070

FACTORIES POLLUTE ILOG BANADERO RIVER

Manila BULLETIN TODAY in English 17 May 82 p 17

[Article by E.T. Suarez]

[Text]

Residents of three barangays in San Pablo city complained yesterday that a river in their area is being polluted heavily by effluents released from the plants of two manufacturing firms.

In a letter to the National Pollution Control Commission (NPCC), barangay officials of Soledad, Sta. Maria and Stmo. Rosario said that Ilog Bañadero from where they used to get water for their daily needs is now so dirty and poses health hazards to residents.

The letter said the pollutants come from the San Pablo Manufacturing located at Schtelig avenue and from a soap factory in barrio Concepcion.

"The water in the river cannot even be used for washing clothes or for watering our plants," the residents said. "The water is so dirty it spreads

foul odor in the areas traversed by the river."

The residents expressed fears that their farms will also be affected because of grease and oil being poured into the river by the firms' plants.

The barangay officials said they brought up this problem three years ago to San Pablo Mayor Cesar P. Dizon who, in turn, notified the NPCC about it.

They said the NPCC conducted three hearings on their complaint but claimed that nothing has been done about it.

Among those who signed the petition were Hilario Atienza, barangay captain of Soledad; Servillano Arevalo, barangay captain of Sta. Maria; Elpidio Moreno, barangay captain of Stmo. Rosario; and Felimon Cuenca, president of Bañadero Integrated Services association.—  
E.T.Suarez

SRI LANKA

COMMITTEE ON WEST COAST EROSION ESTABLISHED

Colombo DAILY NEWS in English 12 May 82 p 1

[Text] Fisheries Minister Festus Perera yesterday appointed a five-member Committee to recommend ways to prevent the sea erosion that is damaging the Negombo Coast.

The committee was appointed at the request of Deputy Minister of Industries Denzil Fernando who said that Kuttiduwa village and the western head has been affected by sea erosion.

The Fisheries Minister however, ruled out Mr Fernando's request for the construction of a barrier at least at one point.

"That may worsen the situation. Barriers should be built after a careful consideration of the movement of the tides, ocean currents and other factors. We might have to construct a chain of barriers," he said.

The committee comprises Mr S.M.S. Jayasiri, Senior Asst. Secretary (Welfare), Fisheries Ministry Mr S.A. Amarasuriya, Chairman, Coast Conservation Board Dr W. Herat, Director NARA, Dr Milton Amaratunga of NARA and Mr Mervyn Jayasooriya, Chairman Ceylon Fisheries Harbours Corporation.

CSO: 5000/5754

POLLUTION FROM INDUSTRIAL, AGRICULTURAL UNITS

Tirana ZERI I POPULLIT in Albanian 12 May 82 p 3

[Article by Faik Toska, inspector in the Ministry of Health: "Keeping the Natural Environment Pure"]

[Excerpts] In the framework of measures for the protection and strengthening of the health of the people, the protection of the environment occupies an important place. The 8th party congress set forth important duties for the most effective and highest quality organization of prophylactic work for the protection of the environment.

According to investigations and studies made by the directorates of hygiene and epidemiology in the districts, in collaboration with the Institute of Hygiene, it is evident that this matter is not regarded seriously everywhere. As a result, there have been cases of environmental pollution. For example, a problem which requires a speedy solution is the pollution of the atmosphere by sulphuric gas emanating from the copper smelting plants in Kukes, Mirdite and Lac. The concentrations of this gas which vary depending on meteorological factors have a bad effect not only on the health of the workers but also on the residents and the crops in nearby areas. Also, some plants which were built at an earlier date, such as the unit for the production of batteries, the asphalt-concrete factories and the thermoelectric power plant in the "Stalin" textile combine, the boilers in the industrial zone in Shkoder, the units of the rubber factory in Durres, etc. which emit dust and soot into the atmosphere are responsible for the deterioration of the air quality.

The problem of environmental pollution becomes more pressing with the intensification of agriculture and the increasing use of chemical powders and fertilizers. Therefore, they should be used on the basis of correct scientific criteria and with strict discipline in all aspects. The careful work which has been done in agricultural units in Lushnje District in regard to this problem should be generalized everywhere; in these units there is concern for the observance of all hygiene and health norms in all aspects, from the storage of products, which include pesticides and insecticides, in warehouses, to their transportation and use on a timely basis and with care.

A good measure for protecting the environment from pollution, in the villages, is the construction of stalls and other buildings used for the processing and

marketing of agricultural and livestock products in accordance with criteria set by the organs of the state health inspectorate. But there are still some agricultural units, such as those in Elbasan, Fier, Shkoder and Pogradec, which are not concerned about constructing these units with all the necessary annexes, despite the fact that all possibilities exist.

Some industrial enterprises of the food industry, such as the Lushnje enterprise, the factory for the production of sauce in the "Ali Kelmendi" combine in Tirana, the refrigeration plant in Vlore City, and others have shown lack of concern for the regulation of drainage systems and packaging and for the timely removal of production wastes.

The Institute of Hygiene, in cooperation with the directorates of hygiene in the main districts, has undertaken a number of studies which show that problems of protection of the environment are health problems as well as social, technical and economic problems. Therefore, their prompt solution requires complex and joint actions, with the participation of doctors, biologists, technical specialists, economists, etc. Also, the ministries concerned and the executive committees of the district peoples councils should coordinate better the work of studying and evaluating the situation and taking measures for the protection of the environment.

CSO: 5000/3015

MEXICO

BRIEFS

VOLCANO DEATHS TOTAL 98--Pichucalco, Chis., 26 April--Up to now army rescue squads have found 98 burned corpses in the vicinity of the Chichonal volcano, the area of most of the victims, said the town mayor, Manuel Carvallo Bastard. The mayor thought that it was "not possible for persons to have survived" in the town of Francisco Leon, which was buried under tons of gravel and sand emitted by the Chichonal volcano. Volcanic activity is now minimal. After having been sheltered in hostels in Villahermosa, Tah., the inhabitants of the area have returned to their communities and are continuing to rebuild their homes with the materials that the government has supplied them. Members of the army today again flew over the area affected by the volcano in search of more bodies. The governor, Juan Sabines, said that resettlement has now been started of hundreds of peasants affected by the eruptions. They received 1,154 hectares in the municipality of Tecpatan for the planting of seeds. [Text] [Mexico City EXCELSIOR in Spanish; article by Porfirio D. Lopez, EXCELSIOR correspondent; Apr 82 p 5-A] 8255

VSO: 5000/2119



AIR, WATER POLLUTION MEASURES

Manama GULF MIRROR in English 24 Apr 82 p 3

[Article by Philip Moore]

[Text] **BAHRAIN has become the beacon of a sweeping Gulf-wide pollution crackdown with the Prime Minister authorising the closure of offending factories and the island now designated the centre of plans to combat the problem.**

Prime Minister, HE Shaikh Khalifa bin Sulman Al Khalifa, recently inspected a village and after complaints by residents, gave leave to the Central Municipal Council to close factories that were not taking anti-pollution measures.

"They have until the end of the month to comply and if they don't, they will be shut down," says Municipality Chairman, Shaikh Abdulla bin Mohammed Al Khalifa.

**Official**

"The Prime Minister told me to 'do what I had to do' after he saw evidence of pollution and talked to the villagers," said Shaikh Abdulla.

There is no anti-pollution legislation on environmental grounds in Bahrain (despite

a mid-week press report to the contrary) and several months ago Shaikh Abdulla had to ask the Ministry of Health for help but now he

has received the official seal from the Prime Minister.

The Municipality action looms as one of the toughest initiatives as Gulf countries launch a scheme to fight pollution, especially at sea, where a U.N. research team describes the situation as "catastrophic".

Bahrain will be the base for the joint Gulf action and the operation will be administered by the island's Health Ministry.

A meeting of the Regional Organisation for the Protection of Marine Environment, comprising representatives from around the Gulf and held under the auspices of the U.N. Environment Programme, has just finished a top-level meeting in Kuwait.

Plans were finalised for two major research projects — into oil pollution in the Gulf and into oceanography plus the setting up of the centre in Bahrain to combat oil pollution and run a massive anti-pollution campaign throughout the region.

Gulf waterways are vulnerable to pollution and although Qatar and Kuwait

are installing sewerage systems, Bahrain was dumping more than half its untreated sewage into the sea.

"We have put a stop to that — we stopped it a couple of months ago," says Shaikh Abdulla, adding that the main task now facing the municipality is making sure air pollution does not get away.

And in the UAE, it was announced this week that a special environment committee has been formed.

Announcing the anti-pollution drive, UAE Federal Council member, Rashid Saif, called on industrial nations to help developing countries protect their environments and urged "all concerned to accelerate and guide development efforts."

Mr Saif confirmed that the UAE had now joined seven other Gulf countries in a marine environment protection drive.

CSO: 5000/4710

## BRIEFS

POSSIBILITY OF RATIONING WATER--Manama--The newly formed Water Resources Council discussed the possibility of water rationing, the Gulf News Agency reports. During its meeting yesterday Commerce and Agriculture Minister Mr Habib Qassim said that a working paper from his ministry on water conservation included the possibility of installing meters on all artesian wells, preparing a programme for maintaining and developing springs and a general policy for digging new wells. It also contained proposals for rationing consumption for farming and household use and industrial consumption. Justice Minister Shaikh Abdulla bin Khalid Al Khalifa will head a committee to study conservation proposals and report back to the council. Bahrain's Prime Minister, Shaikh Khalifa bin Salman Al Khalifa, presided over the Water Resources Council's first meeting yesterday. The Council's session began with a directive from the Prime Minister on the aims the Council and its responsibilities--mainly drawing up the country's water policy and means of conserving water. [Text] [Dubayy KHALEEJ TIMES in English 20 May 82 p 1]

CSO: 5000/4711

## PALESTINIAN STUDY OFFERS VARIOUS STATISTICS ON WEST BANK WATER USE

Beirut SHU'UN FALASTINIYAH in Arabic No 126 May 82 pp 36-37

/Article: "Water Policy in the Occupied West Bank"/

/Text/ Introduction

Water is considered an economic resource of the utmost importance as far as most countries go--especially the countries of the Middle East and North Africa. Although the countries in this region enjoy a relative abundance of land and manpower, the element limiting their increased agricultural output is a shortage of irrigation water, or the misuse of it if it is available. However, the importance of water, as far as the Palestinian people go, transcends purely economic considerations, since it is directly linked to the struggle the Palestinian people are waging in order to support their survival on their territory, in the face of unremitting efforts to deprive them of all these resources for survival, especially land and water.

The circumstances of water in the West Bank involve many technical, economic and political angles and this study cannot cover the subject from all of them. However, it is nonetheless aimed specifically at casting light on the water resources available on the West Bank in terms of type, distribution and volume of production. After we have done this we will proceed to analyze various aspects of water consumption and compare that with consumption in Israel. We will also try to review, in summary fashion, water conditions in Israel in order to arrive at an understanding of the motives and background governing Israeli water policy toward the occupied territories, in particular the West Bank. Finally, we will try to provide some guidelines for domestic water policy under current conditions and restrictions. When conditions change and the Palestinian people gain actual control over their territory, it will be possible to review this entire issue on new bases.

### Rain

Rainwater is considered the sole origin of all viable water sources on the Bank, namely artesian wells, springs and collection wells. The West Bank of Palestine has no snowy areas, rivers or fresh lakes; therefore, all water studies must address themselves at the outset to an analysis of rainfall pattern, in terms of quantity and distribution.

**Volume of Rain:** The West Bank for the most part consists of a range of hills and mountains extending from north to south and paralleling the Mediterranean. Therefore the western slopes of these mountains receive relatively plentiful amounts of rain, ranging from 300 to 650 millimeters. It is to be noted, in general, that the amount of rain drops off sharply on the eastern slopes of the Palestinian mountain range, because these lie on the leeward side. This applies in particular to the mountains paralleling the Jordan Valley area, where no more than 200 millimeters fall a year on the average. The volume of rain also declines as one goes south, amounting to less than 100 millimeters in the Jericho area and 100 to 200 millimeters in the southeastern area of the Governorate of Hebron.

One can get a more detailed idea of the geographical breakdown of West Bank rainfall by studying a map showing rainfall distribution isobars based on average rainfall over 30 years (1931-1960). From such a map, and from readily accessible tables on rainfall in various locations, it is apparent that one can break down the surface area of the Bank in terms of the rain that falls in it as follows:

Less than 250 millimeters:	22 percent
From 250 to 300 millimeters:	10 percent
From 300 to 400 millimeters:	15 percent
From 400 to 500 millimeters:	10 percent
From 500 to 600 millimeters:	22 percent
More than 600 millimeters:	21 percent

Although these rates do not place the West Bank in the category of humid areas, they are to be considered quite high when compared with most countries in the Near East, including Jordan. Table One shows that 79 percent of the land in the Near Eastern countries receive less than 100 millimeters, as compared with 12 percent on the Bank. In comparison with the east bank of the Jordan, in particular, we observe that just 8.6 of the land area in Jordan gets more than 200 millimeters as compared with 80 percent in the West Bank.

Table One: Classification of Ground Area in the Near East by Rainfall Rates (in Square Kilometers)

Country	Surface Area	Less Than 100 Millimeters	Percent of Total	100 to 400 Millimeters	Percent of Total
Iraq	435,000	96,000	22	291,000	67
Jordan	98,000	50,000	51	46,000	47
Syria	185,000	--	--	167,000	90
Lebanon	10,000	--	--	1,000	10
Near East	3,705,000	3,033,000	79	589,000	16
West Bank	5,520	552	10	2,042	37

Abdullah Arar, "The Role of Rainfed Agriculture in the Near East Region," a Paper Submitted to the FAO Regional Seminar on Rainfed Agriculture. Amman, 5-10 May 1979.

The rainfall in the countries along the Mediterranean is characterized by extreme discrepancies between seasons. Therefore arriving at estimates of the volumes of rain that will fall during a normal season is not easy, and such estimates are exposed to a large degree of seasonal deviation. One organization has estimated the volume of rain that fell in the Bank in 1964 and 1965 in the light of these seasonal discrepancies (see Table Two). This organization estimated the volume of rain during two consecutive seasons at 2.8 billion cubic meters.

Table Two reveals an important fact: the volume of water that can be used (under optimum conditions) is about 800 million cubic meters. The strategic importance of this fact becomes apparent when we realize that total consumption by Arab citizens in the West Bank does not exceed 120 million cubic meters a year at the present time.

**Rainfall pattern:** The rainfall pattern on the West Bank (as in other countries on the eastern Mediterranean) is distinguished by specific characteristics that are clearly reflected in the sectors of agriculture and the domestic economy in general. Among the most important of these characteristics are the following:

1. Rainfall is restricted to the winter season, in particular the period between 20 December and 20 January, when about 70 percent of the annual volume of rain falls. Toward the end of March the rainfall finally stops (except for a few showers in April). The dry season lasts until November, although there are violent showers in October whose losses are generally greater than their benefits. In light of this situation, physiological studies on arid regions of Middle East countries have shown that the volume of water that plants lose through evaporation and transpiration (the evapo-transpiration rate) is greater than the volume of water the soil receives from rain for as much as 9 months a year. This proves the extent of the importance of retaining soil humidity and storing it until it is needed for three quarters of the year.

2. The rainfall rate varies extremely between seasons and between months in a single season. Graph one shows the annual volume that fell on the city of Jerusalem from 1850 to 1970. The extreme discrepancy in the volume of rain between years is apparent from this graph. One can consider this state of affairs a paradigm for the remaining areas of the West Bank. Graph Two also shows the extreme weekly differences in the volume of rain that fell in the town of Tulkaram in 1978.

Table Two: Volume of Rain Which Fell in the West Bank and the Courses It Followed (Average for 1964 and 1965)

Volume of rain which fell	2.8 billion cubic meters
Evaporation	1.9 billion
Balance, which is converted to:	0.9 billion
Groundwater	0.724 billion
Water in rivers and streams	0.114 billion
Surface runoff	0.062 billion

"West Bank Hydrology," London, Rolfe and Raffety /sic/ Consulting Engineers, 1965, p 15

Graph One: Annual Fluctuations in the Volume of Rain in the City of Jerusalem  
/Graph in English/

Graph Two: Volume of Rain Per Week Recorded in Tulkaram (1978)  
/Right column/ Millimeters /by tens/  
/Bottom, from right to left/ January February March April May June July August  
September October November December  
/Left column/ Millimeters /by tens/  
Source: Official records.

The two phenomena of the seasonal discrepancies in the volume of rain and the extreme fluctuations within seasons have had a profound effect on agricultural output and rural life in the West Bank. Most years farmers are surprised by the volume and distribution of rain, which can cause them the most grievous damage, for instance when the season starts well and is encouraging enough to persuade farmers to plant their fields with crops (wheat and barley), then may be followed by an absence of rain for many weeks, leading to the drying out of crops and a severe decline in olive and fruit tree crops that depend totally on the rain for irrigation.

3. The rainfall pattern is also marked by intense violence on most occasions when violent, intense storms occur in the course of a few hours. It is clear that this pattern of rainfall inflicts severe damage, not the least of which is the occurrence of extreme topsoil erosion, especially in areas with slopes, which snake up the overwhelming majority of the area of the West Bank. In reality, soil erosion in some areas has reached the point where it constitutes a national economic disaster. The use of tractors for plowing land with slopes along the slopes has helped aggravate the problem.

In another area, we also note that the bulk of the rainwater that falls during rainstorms percolates into watercourses and goes to waste rather than being stored in the ground or behind earthen dams erected for this purpose.

### Springs

There are about 300 springs in the West Bank; however, most of these are seasonal, have low discharges and are of no agricultural value. Even the major springs are characterized by extreme discrepancies in output according to fluctuations in rainfall. In addition their conditions are very bad in general because of abuse and a lack of official interest in developing them and raising their productive capacity.

The best accessible source at present on existing wells in the occupied territories is the hydrological yearbook which the Water Department of the Israeli Ministry of Agriculture issues titled "Hydrological Yearbook of Israel." This report contains a special separate descriptive table for each well showing the volume of its monthly and annual discharge, its rate of concentration of salts and chlorine ions and some other important information. The latest report issued in this series (for 1976-77) contains information on 56 wells in the Bank whose individual discharges exceed 30,000 cubic meters a year. The accompanying well guide shows a table on all these wells, the volume of discharge of each and its chlorine concentration.

The springs are irregularly distributed throughout the Bank. It is apparent from a geographical study of the locations of these springs that most of them lie in the center of the country, on the western slopes of the Palestinian mountains. However, the springs situated on the eastern slopes have a much higher productive capacity; in 1976-77 they produced about 93 percent of the total annual discharges of the springs in the Bank (see Table Three).

#### Artesian Wells

In the Bank there are at present two clusters of artesian wells, one for Arab citizens and the other for Jewish settlers. We will deal with each of these two clusters separately.

Table Three: Number of Springs and Their Total Annual Discharge

	Number of Springs	Total Annual Discharge (in Thousands of Cubic Meters)	Percent
Eastern slopes	24	49,753	93.3
<u>Western slopes</u>	32	3,572	6.7
<u>/Total/</u>	56	53,325	100

Arab wells: In spite of the pressing need for water for agricultural purposes and household purposes both, the production of groundwater from artesian wells began on a broad scale only in the mid-sixties. Until then, new wells were characterized by technological backwardness in terms of the ability of drilling equipment to reach great depths and the type of pump used to pump up the water. The number of wells drilled up to the eve of the Israeli occupation totalled 720, of which 314 are currently pumping while the rest are dry, neglected or shut down for some reason.

One can ascertain the volume of water the Arab wells in the West Bank pump in detail by the readings the Central Water Department takes off the meters on those wells. This department issues a detailed annual report on all of these wells, showing the volume of water pumped up from each one every month. Table Four contains a summary of this report, showing the number of wells operating in each region and the volume of water produced by them in 1977-78.

From this table, it is apparent that the overwhelming majority of the wells are distributed between two areas. First is the plateau strip parallel to the western slopes, lying in the Janin-Tulkaram-Qalqiliyah area. The second main area is al-Aghwar where there are 96 wells that pumped up 26.2 percent of the total. In the mountainous areas of the southern districts, there are only 10 wells, three of which are not pumping; 13.3 percent of the total output was produced from these. Therefore there is a pressing need to drill more wells in these areas especially, in order to solve the problem of the shortage of drinking water (for people and animals) which these areas face from time to time.

Table Four: Number of Arab Artesian Wells, Their Distribution by Region and the Volumes of Water Produced from Them (1977-78)

Region	Number of Operating Wells	Volume of Water Produced (Thousands of Cubic Meters)	Percent of Total
A. Al-Aghwar		9,932.7	26.2
Jericho	40	3,464.5	9.1
Al-'Awja,			
Fasayil	11	1,077.8	2.8
Al-Jiftlik	29	2,656.1	7.0
Marj Na'jah	8	879.5	2.4
Bardalah	8	1,854.8	4.9
B. Wadi al-Fari'ah	23	2,767.3	7.3
C. Western Slopes		20,204.8	53.2
Janin, 'Arabah,	56	3,277.8	8.6
Qibatiyah			
Tulkaram	59	10,128.8	26.7
Qalqiliyah	70	6,798.2	17.9
D. Southern mountain areas		5,033.6	13.3
Ramallah	2	891.6	2.4
Bethlehem	2	3,653.0	9.6
Hebron	6	489.0	1.3
Total	314	37,938.4	100.0

Annual report on monthly well production, 1977-78, Department of Water, West Bank Command, 1979.

Israeli wells: Proceeding from the colonialist policy it pursued from the first months of the occupation, the Israeli government inspired the Makorot Company to start drilling the necessary artesian wells to serve the settlements on which construction work had begun. At the beginning the drilling was confined to the al-Aghwar region, in keeping with the Alon belt settlement plan. In some cases the authorities resorted to taking over some Arab wells owned by absentees (as was the case near the Damiyah Bridge) and exploited them on behalf of the settlements.

There is a controversy over estimates of the number of Israeli wells drilled since the occupation. The latest Central Water Department annual report (for 1977-78) contains just a list of the 17 wells the Makorot Company owns; these all lie in the al-Aghwar area. According to the data in this report, the volume of water produced from these wells came to about 14 million cubic meters that year. Table Five shows a list of these wells and their production volume of as stated in this report.



Table Five: Israeli Wells in the Jordan Valley

Number	Name of Well	Volume of Water Produced (Thousands of Cubic Meters)	Coordinates
1	Jitit One	271.3	186.09/189.40
2	Marj Na'Jah 14	246.7	174.59/198.68
3	Marj Na'jah 29	310.0	174.51/199.64
4	Fari'ah 5	1.1	170.40/186.66
5	Aryeh 1	162.6	171.65/195.90
6	Miswah 1	1,179.8	176.03/193.05
7	Fasayil 2	1,146.4	162.15/189.34
8	Fasayil 3	1,154.9	161.91/188.61
9	Fasayil 4	852.4	165.20/189.70
10	Jericho 1	1,226.8	140.80/190.90
11	Al-'Awja 1	277.3	151.20/187.30
12	Al-'Awja 2	830.7	151.25/187.45
13	'Attarah 1	1,705.5	177.50/192.80
14	Baqi'ah 1	734.5	181.04/196.51
15	Bardalah 1	3,901.0	199.20/194.49
16	Bardalah 2	26.2	unknown
17	Jitit 3	117.6	unknown
/Total/		14,144.8	

Annual report on monthly well production, Department of Water, West Bank Command, 1979, pp 11, 12.

Official estimates of the water produced from the Arab and Israeli wells (Tables Four and Five) reveal an important fact regarding the significance of Israel's water policy in the occupied areas. It is apparent to us that the 17 Israeli wells pumped up about 37 percent as much as all the Arab wells combined, which total 314.

However, the actual number of Israeli wells in the Bank is greater than that stated in this report. In recent years, two new wells were drilled in the al-Aghwar, one in the al-'Awja area and the other in Bardalah. There are also a number of Israeli wells in the mountain areas. Although there are no official statistics on the number or output of these, the information available indicates that there are three wells in the area of Arab Jerusalem, two in al-Latrun, and one each in Kafr Qaddum, Kafr Malik and Kafr Sur. Thus it is believed that the total number of Israeli wells in the Bank is 27. On this basis, the volume of water Israel is pumping up from its wells on the Bank greatly exceeds that mentioned in Table Five; it is perhaps equal to one half the total amount that the Arab wells are pumping.

Lastly, one must refer to a number of wells which the Central Water Department of the Office of Agriculture in the military government owns and operates. This department owns seven wells which have the purpose of supplying nearby Arab villages with drinking water. These wells are situated close to Qabatiyah, Bayt Iba, 'Arabah, al-Fari'ah (all of which have been drilled recently), Bethlehem, al-Zawiyah and Shabtayn.

This department, and all the Arabs working in it, performed many services for the Arab villages adjoining its wells, but one problem that raises complications is that the military government considers itself the owner and heir of these wells and therefore there are strong doubts about its real policy in this regard. One can consider the plans the authorities are making for the Bayt Iba well and others to be an example of what they intend to do ultimately, which is to shift part if not most of the output of these wells to the Israeli settlements adjacent to them.

#### Problems of Artesian Wells

The Arab artesian wells on the Bank faced numerous problems that stand in the way of increasing their production, or even reduce it. Here is a summary of the most important of these problems:

##### 1. Prorating the quantities produced.

The authorities, in the mid-seventies, issued permits to well owners showing the volume of water they were permitted to pump each year and warning them that if they took more than the volumes they were allowed that would make them liable to prosecution in military courts. The official bodies justified these measures on the pretext of preserving groundwater resources, regulating their exploitation and so forth.

As a result of the method by which the process of estimating the quantities one was allowed to pump up and the circumstances in which the prorating policy was applied, grave losses were inflicted on many farmers. The estimate was made on the basis of the actual pumping rate of each well in the years 1975 and 1976, although the farmers were not informed of the real purpose behind the reading of the meters that were installed on their wells, and the circumstances surrounding each well in isolation were not taken into consideration. This produced extreme discrepancies. With wells that were not operating at full capacity during the measuring period for some reason, such as agricultural cycle requirements or the fact that the orchards were recently planted and did not need large quantities of water in their first years of life, the owners of the wells themselves found themselves in an embarrassing situation later, when their need reached its normal level. The owners of the wells that were pumping for the sake of selling water during the measuring period obtained permits for quantities that were greater than their actual production requirements.

However, the most significant damage the prorating process caused could be attributed first of all to the farmers' inability to modernize the irrigation methods they followed at the speed they were forced to. Modern irrigation methods, as we will see later, require a very advanced level of technological understanding and immense amounts of capital that are not available to them from any sources of agricultural financing.

For all these reasons, many persons farming by irrigation were not able to increase production or were compelled to reduce it because of a relative or at times real deficit in the volume of water available to them. However, the problem was much less stringent in the case of farmers who were able to develop irrigation methods in their farms and orchards.

## 2. The decline in productive capacity.

Perhaps the most significant problem all Arab wells face is the decline in productive capacity which is caused by the accumulation of a number of factors leading to this result. The pumps and motors used on those wells are of old types whose capabilities have gradually weakened with the passage of time. In view of their excessive fuel consumption, the cost of operating them has greatly risen, and this has had a tangible effect on the costs of agricultural production. In another area, these wells have reached a very bad state because of the accumulation of silt in the bottoms of their holes and the fact that they have not been worked over since they were drilled. The third reason for the decline in production may be ascribed to the type and depth of the aquifer from which the Arab wells produce. These wells produce from a relatively shallow aquifer known as the Pleistocene, whose depth in general does not exceed 100 meters. The problem here is that wells that produce from a zone like this are likely to be affected rapidly when the groundwater level drops in emergencies, such as a lack of rain for a long period.

The Israeli wells go down to a zone known as the Cenomanian, which can be more than 400 meters deep. Since aquifers at various depths are interconnected by faults, which are characteristic of the geological composition of the area, the burden of drought reaches those only after the Arab wells (which are closer to the surface) have resisted it to the last drop.

The dangers surrounding the Arab wells on the Bank are not far-fetched theoretical possibilities--to the contrary, the problem has started to assume a very real form. In the summer of 1979, most of the wells in the Tulkaram area faced a severe deficit in output which led to a total suspension of pumping in some cases. Naturally a lack of rain helped increase the severity of the problem, but the most important cause was the effect of Israeli artesian wells on adjacent Arab wells. This statement applies in particular to the wells situated in the western plateaus of the Bank, which are competing with a very large number of Israeli wells located west of the Green Line.

### Gathering Wells

Wells for gathering water have occupied a prominent place in the economic and social history of the Palestinian people since the oldest times. There is no village that does not have a number of wells, some of which date back a number of centuries. The main purpose of these wells is to store water in the winter season for use for drinking and watering animals during the long summer months. Unfortunately there are no statistics on the number of these wells, but their number is estimated at from 6,000 to 10,000.

It is clear that the importance of the gathering wells has greatly declined in recent years because of the great expansion in water distribution systems, which draw their water from artesian wells or major springs. This has resulted in the neglect of a large number of wells and damage to some of them. However, there still is a large number of villages that depend on gathering wells in general to meet their drinking water requirements. Therefore we find that the wells in these villages receive an adequate amount of attention and maintenance.

Neglect of gathering wells in the Palestinian countryside is a waste of one factor of production that will probably play an important role in the process of modernizing the means of production in unirrigated agricultural areas. The presence of this sort of well in unirrigated fields and orchards would help solve one of the main problems facing the application of various insecticides and pesticides, since it is not a simple matter to pipe water to fields. Moreover, the presence of water in olive and fruit tree orchards would enable farmers to save a little irrigation water for the seedlings that are planted toward the end of winter and might be in the most intense need of irrigation during the first summer after their planting.

It is worth mentioning that there are some types of modern spraying machines that can be used not just for irrigation purposes but also for pumping water from shallow wells. Perhaps machines of this type can play a big part in developing unirrigated agriculture on the West Bank, in which case gathering wells will play a vital role again.

#### Estimating Water Consumption

Water is principally used for household consumption purposes and for agricultural and industrial production activities. However, its main consumer is agriculture.

There is an extreme discrepancy in experts' estimates of the volume of water consumption on the Bank. The main difference is in their estimates of the volumes consumed in the agricultural sector. Perhaps one reason for the difference in estimates is the massive discrepancy in the productive capacity of springs and artesian wells between seasons, which are subject to changes in rainfall. As a weighted average of various estimates, we can say that the total volume of water consumption on the West Bank is within the limits of 100 million cubic meters, as compared with 1.72 billion cubic meters in Israel (1975). This means that the overall rate of per capita consumption in the Bank is 142 cubic meters as compared with 537 cubic meters in Israel. The discrepancy is reflected in particular in the rate of per capita household consumption, which comes to 13 cubic meters in the Bank as compared with 86 cubic meters in Israel. One should bear in mind that household consumption on the Bank also includes industrial sector consumption while industrial consumption in Israel comes to more than 95 million cubic meters, or roughly the total consumption of water on the Bank (see Table Six).

Table Six: Average Estimates of Water Consumption on the West Bank and in Israel (Millions of Cubic meters)

	West Bank	Israel
Agriculture	90	1,327
Industry (in the case of the West Bank, estimated along with household consumption)	--	96
Household consumption	10	367
Total	100	1,780
Overall per capita consumption rate	142	537
Per capita household consumption rate	13	86

Statistical Abstract of Israel, 1980, Jerusalem, Central Bureau of Statistics, No 316, Page 430.

Some towns and villages suffer from difficult problems in terms of the need for water used for household consumption purposes. In view of the distinctive nature of this type of water consumption, it is recommended that an expert be assigned to deal independently with it. However, in the following section we will address ourselves to the use of water for irrigation purposes.

### Irrigated Farming

The agricultural sector assumes particular importance in the Palestinian national economy. Farming is one of the major economic sectors in terms of its contribution to gross national product, since its share of gross domestic product is estimated at 28 to 32 percent and its share of manpower comes to about 30 percent. However, in addition to that, agriculture is considered one of the most important pillars linking the Palestinian people to their land, purely economic considerations to the side. Therefore the development of this sector must head the list of priorities in all domestic plans to bolster the Palestinian economy.

The total area of the West Bank comes to 5,572,000 donums. However, the portion of that that is cultivated is estimated at just 2,008,700 donums, or 28.9 percent of the total. (1) The irrigated area is estimated at about 77,000 donums, or 4 percent of the total cultivated area. Table Seven shows the distribution of irrigated land by district and type.

Table Seven: Irrigated Land by District and Type, 1978 (in Donums)

District	Vegetables	Citrus	Bananas	Other Trees	Total
Janin	6,547	2,516	--	12	9,075
Tulkaram	14,550	17,005	--	621	32,176
Nabulus*	787	1,563	--	--	2,350
Ramallah	463	206	--	--	669
Jerusalem	--	--	--	--	--
Jericho	24,350	4,576	2,128	150	31,104
Bethlehem	1,011	--	--	--	1,011
Hebron	700	80	--	--	780
Total	48,308	25,945	2,128	783	77,165

### Official Agriculture Department Statistics

\*It should be noted that all the al-Aghwar, which belonged to the District of Nabulus before the occupation, were incorporated into the Jericho Agriculture Department after the occupation. That explains the decline in irrigated land in Nabulus District.

The irrigated acreage shown in Table Seven indicates that the total irrigated land remains relatively fixed in spite of the measures the authorities have taken in the al-Aghwar, which have greatly reduced the cultivated area there. However, farmers in the plain areas have added to the irrigated area through their use of more modern irrigation methods, making up for the shortage which occurred in the al-Aghwar.

A sad fact as far as the West Bank goes is that the percentage of irrigated land there is much less than that in the countries of the Near East, although the Bank

receives more rain than they do, as we have seen previously (see Table Eight). Naturally this situation was an anticipated result of the declared Israeli policy of controlling water resources in the occupied territories.

The real importance of the irrigated farming sector on the West Bank is much greater than these figures would indicate. For example, citrus and irrigated vegetables' share of gross agricultural income ranges from 22 to 30 percent. If we add bananas, nurseries and some other irrigated crops, irrigated agriculture's share may be greater than one third the agricultural income most years.

It is also well known that irrigated farming is the field that responds the most to rapid development through modernization and intensification of means of production. However, we have previously seen the severity of the restrictions imposed on expanded use of water resources. Thus one of the basic goals of national water policy in the current stage is to realize the best possible use of currently accessible water resources. In other words, the most important goal to this end is to exert all possible efforts to expand the irrigated cultivated area by seeking to use modern irrigation methods which will be more capable of bringing water to the root area where the actual need for it lies.

#### Modern Irrigation Methods

Over the past 5 years, tangible development has been achieved in improving the irrigation methods farmers use in the West Bank, thanks to the efforts agricultural advisors and some private organizations have exerted. We will review the achievements which have been made and the obstacles impeding expansion in this field.

Table Eight: Breakdown of Cultivated Land by Irrigated and Non-Irrigated Areas (in Thousands of Donums)

	Total Cultivated Area	Unirrigated Area	Irrigated Area	Proportion of Irrigated Land, Percent
Iraq	59,200	30,000	29,200	49.3
Jordan	5,290	4,900	390	7.4
Syria	54,700	49,600	5,100	9.3
Lebanon	2,760	1,960	800	29.0
West Bank	2,020	1,943	77	3.8

Abdallah Arar, "The Role of Rainfed Agriculture in the Near East Region," a Paper Submitted to the FAO Regional Seminar on Rainfed Agriculture, Amman, 5-10 May 1979.

Water catchment ponds: One of the most important development steps in irrigation methods is that of constructing ponds to store the water produced by artesian wells or springs so that it can be used when needed. There are many very important benefits to this process. In addition to enabling farmers to irrigate their cultivated areas at the appropriate times, it also guarantees that water will be transmitted to irrigation pipes under sufficient pressure so that modern water transmission and distribution methods can be used.

Official 1978 statistics show that there are 83 irrigation ponds in the West Bank with a total capacity of about 262,000 cubic meters. Table Nine shows the distribution of these ponds by district. It appears that they are currently concentrated in the al-Aghwar areas, but Agriculture Department experts recommend the construction of more in the area of al-Qalqiliyah, Tulkaram and Janin. However, the main obstacle in the way of that is the lack of domestic financing sources at the present time.

Table Nine: Number and Capacity of Irrigation Ponds and Their Distribution by District (1978)

District	Number of Ponds	Total Capacity (in Cubic Meters)
Jericho	81	260,000
Tulkaram	1	1,100
Bethlehem	1	500
Total	83	261,600

Official statistics.

Sprinklers and drip pipes: Perhaps one of the most important technological innovations Arab farmers in the Bank acquired in the seventies is their emulation of the drip irrigation system or what is known as "tiftaf," and the system of irrigation by sprinklers. These methods save a great percentage of the water that goes to waste in open earthen canals and through traditional irrigation methods. In addition to that, they make it easy for farmers to use fertilizers and pesticides by dissolving them in the reservoirs and piping them through the irrigation water. It is no secret, either, that these systems require less manual labor, and at the same time, if properly used, guarantee the equitable transmission of water to all the plants. It has been discovered through experience that this will result in an increase in production and greater homogeneity of growth among plants.

Sprinkler and drip irrigation methods have become substantially widespread throughout most irrigated farming areas in the Bank. In 1979, the area of land irrigated by the drip irrigation system came to 13,120 donums and that by sprinklers to 8,070 donums. In addition, there are 850 donums irrigated by what is known as "sharful," which is a simplified drip irrigation technique (see Table 10).

In spite of the relative expansion in the area of land irrigated by modern methods, that still does not amount to more than 17 percent of the total irrigated area. This gives a clear idea of the scope of effort that must be exerted in this field.

Perhaps the greatest obstacle preventing major expansion in this direction is not the farmers' conviction in the feasibility of these methods, since they are totally convinced of it, but the enormous costs these methods require. Estimates by Agriculture Department experts show that expansion costs per donum (in 1978) were 63 Jordanian dinars for sprinklers and 121 dinars for drip pipes. (2)

Table 10: Areas Irrigated by Modern Methods, 1979 (in Donums)

District	Sprinklers	Drip Pipes	(Sharful)
Jericho	908	9,237	850
Nabulus	90	303	--
Janin	1,300	1,000	--
Tulkaram	5,767	2,490	--
Ramallah	5	45	--
Jerusalem	--	--	--
Bethlehem	--	--	--
Hebron	--	45	--
Total	8,070	13,120	850

Official statistics.

However, the advantages the farmers obtain as a result of using these systems, especially drip pipes, justify the massive financial investments in them. A modern economic study carried out by the Jordanian Faculty of Agriculture on the north al-Aghwar areas of Jordan has demonstrated that the per-donum output of tomatoes by drip irrigation is triple that of irrigation by traditional methods and that productivity from the use of plastic houses with drip irrigation was double that of drip irrigation without plastic houses. These conclusions are reflected in the "profitability" of the three systems, as is apparent from the present value of the income per donum over 10 years (see Table 11).

Table 11: An Economic Comparison of Tomato Production Under Various Technological Conditions in the Eastern al-Aghwar of Jordan

	Traditional Irrigation and Farming	Drip Irri- gation	Plastic Houses with Drip Irrigation
Average investment cost (in dinars)	--	280	1,998
Per-donum output (in tons)	1.52	4.5	10
Present value of average per-donum income over 10 years (in dinars)	33.3	115.4	222.7

Akram Satitiyah and Muhammad 'Abbas, "Preliminary Report on the Economic Feasibility of Methods of Producing Tomatoes and Cucumbers," Amman, Faculty of Agriculture, Jordanian University, 1978, page 6.



Although there are no accurate studies on the relative difference in profitability of modern means of irrigation and farming in the West Bank, they do not differ greatly from those in Jordan.

There is a final observation on this subject. It has been noted that the use of modern irrigation methods on the bank is almost entirely restricted to irrigated vegetables and nurseries. These methods have not yet been used in the irrigation of citrus and banana orchards, which are the main consumers of water, and there is no doubt that this situation constitutes a major obstacle to doubling the efficiency of the volumes of water available to farmers on the Bank. Although the issue requires concentrated study, one can assume that the main cause of the farmers' hesitancy is not just confined to the paucity of financing but that it reflects some doubt among most farmers on the suitability of the drip irrigation method with trees.

#### A Summary of Water Conditions in Israel

Talk about water resource conditions on the West Bank is closely linked to water policy in Israel. Here we will try to underline the main features and problems of water conditions in Israel, in order to arrive at an understanding of the motives and dimensions of Israeli policy toward water resources in the occupied areas of Palestine.

Control of land and water is to be considered the main buttress of the Zionist scheme which was aimed at establishing the Jewish state in Palestine. The Jewish Agency and the first Jewish leaders worked to attain Jewish control over water resources in Palestine, including the sources of the Jordan River. In a secret document Ben Gurion wrote in 1941, which the British Foreign Ministry subsequently published, the following appeared: "We must point out that in order for the Jewish state to be able to survive the Jordan and al-Litani waters must be incorporated within our boundaries." (3) In fact, the Jews did carry out most of their water schemes when Israel was established in 1948, since the new state took over most of the water resources in Palestine.

From its establishment, Israel began to carry out a number of ambitious water projects that were aimed at achieving the greatest degree of exploitation of the water resources it had taken over; American financial and technical support enabled it to carry out most of these projects.

Perhaps the greatest water project in Israel is the one known as the National Water Carrier project; this is based on a well known geographical fact, which is that 95 percent of the available water reserves lie in the north of the country, where only 35 percent of the agricultural land is situated. (4)

The original National Carrier Project plan was set out by the American engineer James Hayes in his comprehensive report titled "TVA on the Jordan." Hayes drew his ideas from the famous American project known as the Tennessee Valley Authority. The basic idea of the project concerns collecting water from the Jordan River springs of higher elevations in Lake Tiberias, then piping it to an elevated area, from which it can flow to the central and southern areas of the country. (5)

Lake Tiberias is 165 square kilometers in area and has a capacity of 3 billion cubic meters. The water is pumped from its northwestern shore to a point near Ishad Kinnarot which is 256 meters above sea level. From there the water flows west in an open canal 16 kilometers long, where it is again pumped up to an elevation of 147 meters above sea level. From there, the water is transmitted through a system of massive pipes (270 centimeters in diameter) and open canals about 250 kilometers in total length which feed all the central and southern areas up to the northern Negev west of Beersheba.

## Water Resources

The basic, most important sources of water in Israel are the tributaries of the Jordan River, the al-Hasibani in Syria, the Baniyas in Lebanon, and the al-Dan in northern Palestine. America proposed a project to distribute water among the countries bordering on Jordan River on the basis of recommendations presented by Eric Johnston, the American delegate the American president assigned to study ways of distributing Jordan River water. However, the Arab countries rejected the project, prompting Israel to take over the lion's share of the Jordan water as part of the National Carrier project referred to above. Thus the Jordan River contributes about one-third of the water reserves available to Israel (see Table 12).

Table 12: Water Sources in Israel (in Millions of Cubic Meters)

Source	1949	1975	1980 (estimated)
Jordan River	150	570	600
Groundwater	200	1,150	1,000
Surplus from rivers	--	(50)	100
Sewage recycling	--	(40)	100
Seawater desalination	--	(5)	10
Total	350	1,720	1,810

S. Arlosoroff, "Water Resources Development and Management in Israel, KIDMA Volume 3, Number 10 (1977), page 5.

The major importance of groundwater is also evident from the above table; it contributes about 60 percent of Israel's total water reserve. Here a very important fact stands out: that is that more than half the volume of groundwater referred to in this table (or about 550,000 to 600,000 cubic meters /sic/ percolates into Israel from rainfall areas in the West Bank and through the groundwater zones extending from the western slopes of the West Bank to the coastal areas. This fact, as we will see subsequently, has extreme significance in practice as far as Israeli policy toward the occupied territories and Israel's permanent insistence on preserving its dominance over water resources in the occupied territories are concerned.

## Aspects of Consumption

Water has played a fundamental role in economic and developmental expansion in Israel since its establishment. The water requirements of the agricultural and

industrial sectors and consumption by the population have increased several times over since Israel was established, as appears in Table 13.

Table 13: Development of Water Consumption and Cultivated Area in Israel (Water Volumes in Millions of Cubic Meters)

	1949	Percent	1975	Percent	1980 (Estimate)	Percent
Agriculture	260	74.3	1,325	77.0	1,260	69.6
Industry	15	4.3	95	5.5	150	8.3
Consumption by the population	75	21.4	300	17.5	400	22.1
<u>/Total/</u>	350	100	1,720	100	1,810	100

(Area in Thousands of Donums)

	1949	1975	1980
Cultivated area	2,000	4,000	5,000
Irrigated area	500	1,800	2,000
Ratio of irrigated land, percent	25	45	40

Ibid, p 5

As is to be expected, agriculture has been the main consumer of water, since its share has ranged from 70 to 75 percent of total consumption. That has been reflected on irrigated land area, which has increased from 500,000 donums in 1949, that is, 25 percent of the cultivated area, to about 2 million donums in 1980, or 40 percent of the cultivated area.

#### Water Organizations in Israel\*

The use of water in Israel is governed by legislation issued in 1949 which stipulates that ownership of all water resources is to be public and under government control. By virtue of this legislation, this responsibility is conferred upon the minister of agriculture in the person of the director general of the Water Department in Israel (the water commissioner), who is to be assisted by a higher water supervisory committee known as the Water Commission. The water commissioner has been granted all organizational powers related to water, such as the power to issue permits to drill wells and determine production volumes and work conditions.

\*In preparing this section, the researcher sought the aid of the following work: "Israel's Water Policies," Uri Davis et al, Journal of Palestine Studies, Issue 34, Volume IX, Number Two, Winter 1980.

The second organization which deals with water in Israel is the Tahal company, which is also known as the Israel National Water Planning Company. It was founded in 1952 with 52 percent participation from the Israeli government, 24 percent participation from the Jewish Agency and 24 percent participation from the Jewish National Fund. This company has been given the tasks of planning and study related to water resources in Israel, with the objective of improving the capacity to exploit available resources as much as possible.

This company has exported its services to many countries in Africa and South America.

The third and most important organization in the Israeli water system is the Mekorot Company. This company was founded in 1937. The Israeli government owns 33 percent of the shares in it, the Jewish Agency 33.5 percent and the Jewish National Fund 33.5 percent. Since its establishment, this has been assigned all the executive tasks related to the exploitation of water resources, including the construction and management of all national water projects. This company's tasks were redefined and emphasized in 1964 and it was given the title of the National Water Authority.

#### Water Problems in Israel

In the course of the past 30 years, Israel has managed to achieve almost complete exploitation of all the water resources readily accessible to it. As we have seen, the bulk of these resources originate for the most part outside Israel's 1948 borders, in Lebanon, Syria, Jordan or the West Bank.

However, Israel, nonetheless, still suffers from serious water problems that arise from its expansionist structure, which has the goal of consolidating Jewish settlements inside and outside the 1949 cease fire lines. The establishment and support of settlements require the concentration of agricultural and industrial production to the maximum extent readily available economic resources will permit. It seems that the factor limiting expansion in agricultural production is not land but water. Therefore we see that there has been constant increase in the volume of water used in agriculture along with a decline in the volume of water required per donum. In another area, industrial requirements for water have increased rapidly, to the point where they have come to constitute about 8 percent of total consumption. It is expected that the volume of water needed for this purpose will increase greatly, in light of the emphasis the government is placing on the industrial sector. In addition, the population's water consumption will increase rapidly because of the horizontal expansion in the number of settlements and the constant improvement in the standard of living.

The net result of these expectations is embodied in the fact that Israel will be suffering from a great deficit in the volume of water it needs. The Mekorot Company estimated this deficit at 250 to 350 million cubic meters in the second half of the seventies. (6) In the eighties, the water commissioner estimates the anticipated deficit at 450 million cubic meters. (7)

Table 14 shows an estimate of the volumes of water required for consumption in 1985, according to the report the Israeli delegation presented to the desert

conference held in Nairobi, Kenya in September 1977. The enormous size of the anticipated deficit in the volume of water required is obvious, once we realize that the maximum water reserve available to Israel in the mid-seventies was about 1.7 billion cubic meters.

Table 14: Estimate of Water Volumes consumed in 1974 and 1975 (in millions of cubic meters)

	1974	1975
Urban Consumption and Industry	410	700-800
Agricultural Consumption	1,170	1,170
Loss and Waste	60	130
Total	1,640	2,000-2,100

Israel's report to the U.N. Conference on Desertification, August 29-September 9, 1977, Nairobi, Kenya.

The second water problem in Israel is the possibility of salt water incursion into aquifers in the central and northern areas of the country. It appeared, in the course of the seventies that there was potential encroachment by salt water fronts on the main aquifers in the Ra's al-'Ayn area and the northern plains from more than one direction. It is believed that excess pumping from these zones, in addition to the extreme rainwater deficit in some seasons, helped exacerbate this problem. Therefore the Mekorot Company resorted to injecting large amounts of surplus water into the aquifers in the central areas of the country in the rainy season in order to raise the groundwater level to a point that would prevent salt water encroachment from adjacent western zones.

#### Probable Solutions to the Water Shortage Problem in Israel

The foregoing facts show the main contradictions that govern water policy in Israel. It has used all the special resources it could, but its current and future requirements require that it look for large additional amounts of water. Here is a brief summary of the sources that have been broached to eliminate the anticipated shortage.

1. The search for new sources inside Israel's borders. We have already seen that this solution offers no new potential, since all water sources have been completely exploited.
2. Seeding clouds with silvery salts. Intensified studies were made in this area and it ultimately became evident that this method is not effective, that its results are unpredictable and that it cannot help solve Israel's water problem in a tangible manner. (8)
3. Seawater desalination through the use of atomic power. Although it is possible to think of providing potable water by this method, in the manner of the plant erected at Eilat, which supplies that town with half its water needs, the high

cost of the water produced by this method (about 30 cents per cubic meter) will make its use for agricultural production purposes impractical before the latter part of this century, in the opinion of the former director of the Water Department in Israel. (9)

4. Recycling sewage in heavily populated areas; this method is distinguished by its low cost (about 4 cents per cubic meter) but on the other hand it cannot be a source of real benefit before the end of this century, when it is estimated that the volume of water recycled from sewers will total 325 million cubic meters a year. (10) In addition, the water produced by this method leads to health complications that greatly limit the possibility for use on a broad scale.

5. Development of more efficient water use methods. This applies in particular to the agricultural sector, which consumes about 75 percent of the total volume. One will recall that sprinklers are used in irrigating 87 percent of the irrigated land, while drip pipes are used in 10 percent of the territory irrigated. (11) These methods are distinguished by very high efficiency, to the point where Israel is now using 98 percent of its exploitable water resources. (12) It has been proved that drip pipes are about one third more efficient than sprinklers. However, the process of replacing the sprinklers does not make this a solution of unquestionable value in coping with the problem of the shortage of Israel's water requirements in the eighties.

#### Basic Elements of Israeli Water Policy

One can summarize the main foundations on which Israeli water policy is based as follows:

1. Development of efficiency in the use of readily accessible water resources to the highest possible level.
2. Striving to take over new water resources outside the borders of Palestine. There has been more than one hint of Israel's real intentions regarding the waters of the al-Litani and the al-Yarmuk.
3. The effort to exploit accessible water resources in the occupied territories, especially the West Bank, as part of a general plan that is aimed at the following:
  - A. Restricting Arab citizens' water use to the narrowest framework.
  - B. Enabling the settlements to drain off the greatest amount of surplus water that can be used; Israeli experts estimate this at about 150 million cubic meters (13)
  - C. Adopting measures that will guarantee the percolation of surface water and groundwater into the coastal areas via the western slopes of the Bank, which constitute the supply source for more than half the groundwater in Israel.

#### Examples of the Policy of Restricting Water Use by Arab Citizens

Some well-informed experts believe that the Israeli government has actually decreed the imposition of a ceiling of no more than 35 million cubic meters on the amount

of water that the owners of Arab wells in the Bank are allowed to pump. Thus their total volume of consumption would be about 100 to 120 million cubic meters. To achieve this goal, the authorities have adopted a number of measures, among them the following:

1. Strictly prohibiting the drilling of new wells for agricultural purposes. One well actually has been drilled for this purpose since the beginning of the occupation, and the military government recently issued two drilling permits for the al-'Awja region after the international outcry stirred up by the issue of the desiccation of the springs and wells there through the influence of adjacent Israeli wells.

2. Restricting permits for drilling potable water wells to the narrowest framework. So far the military government has given agreement only to five wells, on behalf of the municipalities of Nabulus (two wells), Qalqiliyah, Tulkaram and Qaffin.

3. Imposing stringent prorationing on pumping from Arab wells and bringing violators to military court. We have already reviewed the manner and circumstances of this limitation. In fact, this step has, in addition to the earlier reference on the prohibition of new well drilling, helped restrict the pumping up of ground-water for Arab citizens to the volume specified above.

4. Harassing farmers in irrigated areas on "security" grounds. The authorities have adopted many steps in this field. Herewith, as follows, are samples of these:

- A. In the early part of the occupation, the authorities took the initiative of blowing up 140 pumps situated on the West Bank of the Jordan River which were used for irrigating the plantations and farms situated on the plateau strip alongside the Jordan River, which is known as the al-Aghwar area. Before the occupation, this region was one of the most fertile and important areas of vegetable output on the West Bank.

- B. Shutting down extensive areas of good farmland in the al-Aghwar, al-Buqayqah and other areas. It is estimated that more than 80,000 donums were shut down north of the Nabulus-Damiyah Road alone.

- C. Compelling a number of farmers to exchange their land for other land controlled by the absentee property custodian. Naturally many farmers rejected this offer because of the problems and complications it would cause among Arab citizens themselves; therefore they were compelled to leave their farms and move on to neighboring towns and villages.

- D. Plowing up and demolishing irrigation channels in the al-Jiftlik area in the summer of 1979 on the pretext of building a new "security belt." That caused extreme damage to the owners of plantations and farms in the area.

- E. Resisting every project that might ultimately result in increasing the quantity of water the Arab citizens use or the area of irrigated land in their possession. An example of this is the hostile policy the authorities and the media are pursuing toward ANERA (American Near East Refugees' Aid) after it agreed to finance a project to replace the al-Fari'ah earthen channel with a system of pipes. The authorities

actually did refuse to agree to the construction of this project although the technical studies the American and Arab experts carried out proved that that would result in doubling the efficiency of the use of the water transmitted through it.

F. The bad condition the settlements Palestinian farmers established hundreds of years ago on the slopes of the hills in the West Bank are to be considered a vivid example of the results of the economic policies in the Bank. The retaining walls have greatly deteriorated because of the crippling increase in workers' wages. That has resulted in the occurrence of severe erosion of topsoil in the mountain slopes and the runoff of the bulk of the rainwater into watercourses which ultimately go down into the coastal areas in Israel. The deliberate neglect of the groves in the Bank also lies within the framework of this policy; in some cases this has reached the point of combating forestry activities and abusing existing groves.

#### Examples of Israeli Exploitation of Water Resources on the Bank

The other half of basic Israeli policy on water resources in the occupied territories is the effort to exploit them in a colonialist fashion primarily aimed at realizing Israeli interests. It has been observed that successive Israeli governments have agreed on the need to strengthen their total control of water resources on the Bank, using the excuse of the need to coordinate the exploitation of these resources on behalf of "both parties." Here are some examples of Israeli measures that are gaining Israel control over the lion's share of West Bank water:

1. Israel has drilled 27 artesian wells in the Bank; these pump up about half as much water as all the Arab wells combined, which number 314. There still is an intention to drill more such wells.
2. At a time when Arab farmers have been prohibited from using Jordan River water to irrigate the al-Aghwar area, as we mentioned above, the authorities have permitted Israeli settlers in the northern Jordan Valley to pump water from the river for use in irrigating some of the crops that can tolerate a moderate salt concentration (such as grapes). It is estimated that Israel is pumping up about a million cubic meters in the framework of this project, which is known as the Jiljal water project.

With encouragement from the authorities, some settlements and military barracks obtain relatively large amounts of water from a number of the Arab springs and wells the Central Water Department supervises. This is done either by pumping through a system of pipes or by transporting water in large tank trucks.

#### Repercussions of Israeli Water Policy on the Future of the Bank

The measures Israel has taken regarding water resources on the Bank have produced results that have had a profound effect on Palestinian citizens on the West Bank. The first and most important result of Israeli water policy has been its repercussions on the agricultural sector. Although the effects of the occupation on this sector are complicated and very diverse one can in general conclude that the occupation has led to a regression in the volume of the gross agricultural output of most branches of agricultural production, going by the rate of production in the



6 years before the occupation and after it. (14) Production of grain declined 28 percent, that of vegetables 18 percent and that of cucumbers 89 percent, while fruit production increased 7 percent. Although the effects of the occupation on nonirrigated agriculture merit study and attention, especially since 96 percent of the farmland is farmed without irrigation, what interests us here is to note what has happened in the irrigated areas, especially in the Jordan Valley. The al-Aghwar, in the sixties, became one of the most important areas of agricultural production on both banks and one of the most open to rapid irrigated farming expansion. It should be pointed out that the second phase of the East al-Ghawr Canal, on which work began a few months before the occupation, entailed the laying of a major canal and a branch system on the West side of the Jordan River. This canal was to irrigate more than 30,000 donums--that is, it would increase the irrigated area by 40 percent. One can assume that the thousands of donums which the thousands of Israeli settlers are irrigating in the Jordan Valley would have been hooked up to water and farmed by Arab citizens before the end of the sixties had the occupation not occurred.

In the western coastal areas, farming has been greatly affected by the refusal to permit the drilling of new wells and the prorationing of output from existing ones. Experts in agricultural circles estimate that it is possible to put no less than 30,000 donums under intensified irrigated farming if permission is granted to drill a further number of artesian wells; however, the authorities rely on the excuse that it is necessary to regulate pumping in order to protect the aquifers from salinity--thereby ignoring the real situation, which is that the threat of salinity comes from the tremendous volume the Israeli wells are pumping up on the coastal plains, not the puny Arab wells with their limited capacities. We saw earlier (Tables Three and 10) that the amount pumped from all Arab wells combined is about 37 million cubic meters, while the volume of groundwater Israel uses totals 1.15 billion cubic meters.

The backward nature of agricultural production has had great repercussions on the economic and social structure of the Bank. The agricultural sector was the main source of income for the majority of the inhabitants and the sector that absorbed most of the manpower. Now, however, many farmers and people working in occupations complementary to farming have been turned into workers in Israel and their wages now constitute the backbone of the economy of the West Bank.

Perhaps the clearest example of the effect of Israeli water policy is what happened in the areas of Bardalah and al-'Awja situated in the Jordan Valley, since what happened there is a paradigm of what will happen in all areas of the Bank with the passage of time. Therefore it is beneficial to learn the truth of what is going on in these two areas.

#### The Bardalah Case

The village of Bardalah is situated near the northern boundary of the Jordan Valley, 3 kilometers from the Israeli borders. It is inhabited by about 1,000 people from Tubas. About 3 kilometers southeast of Bardalah there is the village of 'Ayn al-Bayda', which has a population of 800.

The Bardalah-'Ayn al-Bayda' area is considered to be one of the major vegetable producing areas in the West Bank; about 5,500 donums are farmed under irrigation there. Water is obtained from artesian wells (eight in number) and springs (11 in number). The signs of change in Bardalah began to appear in 1968 when Israel established the settlement of Mahula, for which it drilled a 24-inch well that is able to pump 1,600 cubic meters an hour, as compared with 220 cubic meters in the main Arab well in the village. Naturally that resulted in a continuous, rapid drop in the groundwater level and a drop in discharge by the springs, to the point where six wells and 11 springs dried out. That led to a total drought in the citrus orchards of 'Ayn al-Bayda' and Bardalah and a great drop in vegetable production among Arab farmers.

The authorities' way of coping with the ramifications of the situation offers a vivid example of what Israel means when it talks about its desire to control water resources in the occupied territories. Following protracted negotiations and delays, the authorities agreed to supply the owners of fields who had suffered damage with water from the Israeli Mekorot Company at local production cost, provided that all absentee workers in the territories be excluded from that. Less than 2 years later, the authorities drilled a new well several meters away from the village well. The new well started producing in May 1979 at a rate of 700 cubic meters per hour. The Mekorot Company will provide Arab farmers with about 950,000 cubic meters a year, or about one quarter of its annual output. The Israeli settlers will use the rest to increase production and expand the area of settlements.

#### The al-'Awja Case

The village of al-'Awja is situated on the Jordan Valley 10 kilometers north of the city of Jericho. The population of this village came to 8,000 shortly before the occupation in June 1967. However, during and shortly after the war about 6,000 of its inhabitants departed and just 2,000 remained.

The al-'Awja area is distinguished by being one of the most important area of banana, citrus and vegetable production in the West Bank. The areas farmed in the 1978-79 season were estimated at 5,000 donums for vegetables, 1,450 donums for bananas, 250 donums for citrus, and 3,000 donums for grain. It is to be noted that the population there relies almost totally on agriculture for a living, because it is remote from the main commercial centers of the Bank and the workers also have difficulty in getting transportation to Israel.

The farmers in al-'Awja receive the necessary water for their crops from the al-'Awja spring and adjacent artesian wells. This is one of the largest springs on the West Bank, since its annual discharge is estimated at about 5.7 million cubic meters.

The problems in the village of al-'Awja began when the Israeli authorities drilled three artesian wells near the village spring. As would be expected, that led to a perceptible drop in the discharge of the spring. The situation then worsened because of the scant rainfall in the past 2 years, which caused the well to dry up altogether in spring of last year, 1979. Of course that created a real catastrophe for the farmers, resulting in the desiccation of 1,300 donums of bananas and 150

donums of citrus, the net worth of whose annual net output is estimated at \$2.7 million. Irrigated vegetable farming also declined by 2,000 donums, most of which were irrigated by the drip system. This means that tremendous amounts of capital in the form of motors, pipes and irrigation ponds were frozen and, as a result of all that, three quarters of the population left, leaving 500 who shifted from farming to being hired workers in the nearby Israeli settlements.

One of the sad discrepancies is that while the people of al-'Awja have been lacking potable water, the nearby Jewish settlers have been blessed with swimming pools and dispose of water as they like.

After many reviews with the military governor, and pressure from the local and international press, the authorities agreed to supply the village inhabitants with drinking water from an Israeli well through a pipe laid from the well to the village. However, the authorities refused to respond to the inhabitants' demands that they be given permits to drill new wells. After concentrated pressure from the international media, the authorities issued just two permits, claiming that the groundwater reserves in the region were not sufficient to supply additional wells besides the Israeli (and Arab) ones that exist now.

#### Recommendations

For 13 years the West Bank and the Gaza Strip have been staggering under an Israeli occupation that has spared no effort to mobilize all the two areas' economic resources, especially water, in an annexationist fashion, realizing Israeli economic interests first and last. The basic focal point in most economic studies related to the occupied Palestinian territories has been to set forth economic conceptions of these areas in the context of an independent Palestinian state, ignoring the fact that every day Israel creates a new state of affairs which diminishes the economic assets and activities of the proposed state and ultimately turns it into a theoretical subject devoid of real meaning. Therefore concentrated effort must be made to study economic, social and cultural sectors under current circumstances and do everything that will have the effect of strengthening the perseverance of the citizens on the West Bank and the Gaza Strip in the face of Israeli policy, which is trying to swallow up the land, drive its population out and turn those who remain into workers in Israeli factories.

In this study we will confine ourselves to highlighting a number of recommendations that are aimed at remedying water problems the citizens in the West Bank suffer from as they are staggering under the occupation. Of course it will not be easy to carry some of these recommendations out, in view of the firm Israeli control of water resources in the occupied territories. However, this just means greater determination and concern to carry out a national water policy in the transitional occupation stage.

The basic slogan of Palestinian water policy in the current transitional stage is to seek to acquire the best use of the water resources readily available to the Arab citizens and at the same time resist Israeli dominance of water resources in the political, media and legal areas.

## Recommendations on Improving Water Resource Use Capability

Agriculture absorbs about 90 percent of the total water consumption on the Bank. Therefore one must concentrate on developing irrigation methods in a manner where the farmers will be able to expand the irrigated area by as much as 80 percent while using the same amount of water. It is no secret that current irrigation methods are very wasteful of water, as we mentioned above; in addition, they require many man-hours.

The following recommendations will help raise irrigation water use capability to a large degree. However, they do not include an adequate amount of technical and economic detail. Therefore specialists must be assigned to provide further details on all of them to the Palestinian and philanthropic bodies that are concerned with financing these projects in order to adopt suitable executive measures.

1. Replacing the dirt canals as channels for water from springs and wells with pipes wherever possible. The most prominent example of that is the al-Fari'ah Canal, which the farmers who benefitted from it and the ANERA organization agreed should be replaced by pipes, although the project has not been carried out yet since the authorities have rejected it.

2. Setting out a plan to support the process of replacing traditional irrigation methods by the drip system. One must insist that this system include citrus and banana plantations.

The success of this plan will demand concentrated effort in the field, and this will require that domestic sources of financing contribute some of the costs of the system the farms will require, because this investment will have a nationwide payout as well as being an individual investment. It is possible to benefit from the experience of the Mennonite Philanthropic Society's experience in this field; this helped spread the drip irrigation system through the al-Aghwar.

3. Encouraging the construction of more dirt and cement irrigation ponds by providing needed loans on encouraging terms. Here construction and financial services must be coordinated by one or more bodies that are able to get in direct, continuous contact with the farmers who benefit, such as cooperative and philanthropic societies and town councils.

4. Assigning a team of hydrological experts to make a detailed study of well conditions on the West Bank and offering recommendations on the proposed projects to improve conditions in them. It is recommended that the team that is assigned to do the study consist of two Palestinian experts, one from the West Bank and the other a Natural Resources Authority expert in Jordan.

5. Encouraging farmers in the unirrigated areas to construct retaining walls and repair walls that have been destroyed as part of a plan to redevelop unirrigated lands that have suitable gradients, along the lines of the many projects that Jordan has established to support unirrigated farming. It is recommended that the new settlements be planted with olive and grape seedlings, which should be distributed at low prices among farmers who benefit. Naturally the first step in

these projects would be to obtain the best possible use from rainwater by erecting retaining walls and preventing the runoff of water and soil into the watercourses. It is no secret that this project cannot have an attractive economic yield at the present time. In view of the fact that it is a national investment of the first stripe, the national bodies must offer the farmers taking part in it no less than one third its estimated costs.

6. Encouraging farmers who want to benefit from the abovementioned unirrigated land reclamation project to repair the damaged gathering wells located on their territories in order to make use of the water from these wells for purposes of spraying insecticides and pesticides on the one hand and irrigating new seedlings the first season after their planting on the other.

7. It is clear that Israel has not sought and will not seek to establish any irrigation project that is aimed at benefiting from the rainwater running in the watercourses on the Bank during the winter season, because it considers this contrary to its own interests. However, the Palestinian party cannot give in to that; it must demand the construction of several earth dams in specific areas for rainwater collection and use. The first step will be to assign a team of engineering specialists to set out the necessary studies for the proposed dams. After that, domestic bodies at home and abroad should press for the execution of the proposed projects.

8. Setting out a plan to develop artesian wells, either by deepening them or by renovating the pumps used on them. It is necessary that the requisite financial and technical support be made available for this process; one can seek the aid of Water and Agricultural Guidance Department experts in studying the applications presented.

9. Providing political and material support for the towns and villages of Hebron Governorate to acquire permits to drill new wells for drinking purposes.

#### Studies, Publicity and Legal Measures

1. Assigning the Arab Agricultural Development Organization to carry out a new climatic study on the West Bank (and the Gaza Strip) and on the relationship between climate and agricultural output. One should bear in mind that this organization prepared a brief report in this regard on Palestine but it is deficient in many details because of the paucity of information available to the team assigned to prepare the study. Therefore it is proposed that some experts residing on the occupied territories, especially people engaged in university teaching, participate in the new team.

2. It is necessary to obtain on a regular basis all issues of the annual hydrological reports the Water Department of the Israeli Ministry of Agriculture issues, the annual report of the military government's Water Department, and all other similar publications, then to issue an annual water bulletin in Arabic and English relying on the information contained in these reports. It is necessary to exert the greatest possible effort to learn about particular conditions in the Arab and Israeli artesian wells located in the occupied territories. Perhaps it will be necessary to start a special file on each of these at a later time.

3. Local and international media coverage of the measures Israel is adopting to take over water resources and Arab lands on the Bank and in the Strip are inadequate. One should realize that the Western media are showing great interest in this subject; therefore it is suggested that special effort be made to convey the truth of the situation to international circles.

4. The issue of Israeli dominance of water resources on the occupied territories has not been given the legal resistance that the issue of the takeover of land has. Therefore it is suggested that special bodies be assigned to study the legal aspects of all cases in which Israel has directly or indirectly taken over Arab water then seek to raise them most forcefully locally and internationally whenever possible.

/Footnotes/

1. "Administered Territories Statistics Quarterly," Vol X, No 1-2, 1980, p 95.
2. Information gathered in the course of meetings with agricultural experts and workers.
3. MA'ARIV, 18 April 1972.
4. S. Arlosoroff, "Water Resources Development and Management in Israel," KIDMA, Vol 3, No 2, 10 (1977), p 6.
5. E. Orni and E. Erfat, "Geography of Israel," Jerusalem, Israel Universities Press, 3rd Edition, 1973, pp 447-451.
6. M. Yacobovitch, YEDIOT AHARONOT, 2 February 1973.
7. HAARETZ, 5 June 1978.
8. THE JERUSALEM POST, 31 July 1978.
9. DAVAR, 26 November 1978.
10. THE ISRAEL ECONOMIST, October 1978, p 38.
11. Ibid, pp 35-36.
12. Ibid, Jan/Feb 1977, p 6.
13. Y. Bonet and U. Blaide, "Water Resources and Their Exploitation in Judea and Samaria," p 17.
14. Hisham Awartani, "West Bank Agriculture, A New Outlook," Nabulus: al-Najah National University Research Bulletin, No 1, 1978, pp 10-15.

# Guide to Wells on the West Bank

## A. Western Zones

Number of Zone	Well Number	Well Name	Annual Dis- charge Volume (Thousand Cub- ic Meters)	Average Annual Discharge (Lit- ers per Second)	Chlorine Concen- tration (milli- grams per Liter)
8	8220	Barqayn	51	1.6	150
8	8210	Janin	123	3.8	NA
14	4260	Barta'ah	135	4.2	82
15	15240	Ra's al-'Ayn	337	11.0	NA
15	15241	Al-'Asal	118	3.7	NA
15	15242	Qaryun	404	13.0	NA
15	15290	'Uyun Barqah	72	2.2	41
15	15248	Bayt al-Ma'	433	14.0	NA
15	15255	Zuwata	306	9.6	24
15	15243	Sharish	184	5.8	108
15	15244	Fu'ad	91	2.8	197
15	15258	Harun	167	5.3	22
15	15256	Kafr Furat	65	2.0	26
17	17295	'Ajul	33	1.0	33
17	17318	Shamiyah	45	1.4	30
17	17320	Matwah	60	1.9	37
17	17330	Dalbah and 'Ayn al-Laqtan	93	2.9	26
17	17430	'Ayn 'Arik al- Fawqah	219	4.9	23
17	17432	'Ayn 'Arik al- Tahta	131	4.1	35
17	17450	Wadi Dalab	191	6.0	26
17	17453	Harshah	66	2.1	25
18	18218	Batir	63	1.9	25
19	19225	Qanar al-Gharbi- yah	21	0.6	34

## B. Eastern Zones

39	33958	Al-Shamsiyah al- Fawqa	122	3.8	83
39	39360	Al-Bayda	190	6.0	74
39	39362	Al-Shamsiyah al- Tahta	222	7.0	74
39	39365	Al-Dayr	67	2.1	163
43	41250	'Uyun Hamam al-Milh	708	22.0	1,425
43	43225	'Ayn al-Fari'ah	4,334	137.0	51
43	43240	Dulayb	353	11.0	57
43	43250	'Uyun al-Sidrah	253	8.0	30

43	43255	Hamad and 'Ayn al-Bayda	826	26.0	32
43	43256	Al-Qudayrah	995	2.0	31
43	43258	Al-Jisr	173	5.4	32
43	43260	Al-Tabban	1,313	42.0	33
43	43270	Dafna	54	1.7	NA
43	43260	Ballatah	116	3.7	32
43	43290	Al-Subyan	180	5.6	33
43	43315	Abu Salih	103	3.2	48
43	43320	'Uyun Maskah	1,685	53.0	58
43	43340	Shibli	1,144	36.0	56
45	45250	'Uyun Fasayil	563	17.0	39
45	45350	Al-'Awja	5,646	179.0	30
45	45450	Shushah	542	17.0	32
45	45453	Al-Duyuk	4,988	158.0	31
45	45451	Al-Nuway'imah	2,200	70.0	31
46	46360	Al-Fawwar	NA	NA	31
46	46370	Al-Qalat and al-Fawwar	3,028	96.0	27
46	46380	Al-Sultan	5,805	184.0	31
48	48240	Ghazal	308	9.7	2,460
48	48245	'Uyun al-	12,039	381.0	2,118
	to 48268	Fashkhah			
48	48325	'Aytan	NA	NA	30
48	48330	Artas	18	6.9	30
48	48412	Su'ayr	22	0.7	37
Total, Eastern Zones			49,753	93.3 percent	
Total, Western Zones			3,572	6.7 percent	
Grand total			53,325	100.0 percent	

Hydrological Yearbook of Israel, Jerusalem, Ministry of Agriculture, Water Commission, 1978.

11887

CSO: 5000/4709



## DROUGHT KILLS CROPS, CATTLE, ECONOMY RUINED

Johannesburg THE CITIZEN in English 24 May 82 p 12

[Text]

**GABORONE.** — Botswana, striving to maintain its peaceful and modest prosperity in troubled Southern Africa, has been rudely shaken lately by acts of God and man.

It is in the midst of its biggest economic crisis since independence 16 years ago due to a slump in the world diamond market largely caused by the capriciousness of the rich.

On top of that, it was afflicted by a severe drought which has scorched arable areas, ruining crops and killing cattle, the second pillar of the economy after minerals.

Amid this adversity, some officials quietly worry about Botswana's physical position, landlocked between restless neighbours.

With Black South African refugees creating the country's first crime wave, with the war in South West Africa lapping over another border and violence in southern Zimbabwe licking at a third, one top official murmured "look at Lebanon" when he privately reviewed the situation in this traditional oasis of peace and racial harmony.

No one seriously believes that Botswana will be ravaged like Le-

banon, but there is serious concern that the region's instability will increasingly manifest itself.

Botswana is bigger than France but has a population of only 940 000, most of whom shelter in a splinter of hospitable land, lodged between South-western Zimbabwe and the north-west of south Africa. Two-thirds of Botswana is occupied by the sand-filled basin of the Kalahari Desert.

At independence in 1966 the then British protectorate of Bechuanaland was one of Africa's Cinderellas. It had five km of paved highway, a railway with no branch lines, a fledgling mining industry and poor social services.

Since then, until last year, Botswana has been an African economic miracle, its people enjoying an unbroken run of steadily improving living standards.

Growth has averaged 10 percent a year since independence, one of the fastest rates in the world. Gross domestic product grew over 20 fold since 1966.

Two years ago Botswana had an embarrassment of riches for one of the world's poorest 30 nations, with sufficient reserves for nine months' imports. The balance of trade was in robust surplus, and Ga-

borone's devoutly capitalist bankers and economists were often likened to the gnomes of Zurich.

Good health services were created to bring 90 percent of the population to within 12 km of a clinic. Ninety percent of children go to primary school, against 40 percent in 1966.

Roads were built, small industry was encouraged and mining and cattle ranching boomed.

But the constant betterment which the people had come to accept almost as a natural law, with more jobs and higher pay each year, has now slammed into a wall of recession.

In his Budget speech last February, Finance Minister, Mr Peter Mmusi, said the outlook was bleak for the near future. As exports tumbled and imports rose, he announced a wage freeze for State employees and a 20 percent cut in public spending.

This month, the Botswana currency, the Pula, was devalued by 10 percent against a basket of currencies.

The Western world's recession has slashed demand for Botswana's copper and nickel and diamonds, which account for 33 percent of the GDP and 82 percent of exports in 1980. Diamond income alone was

halved in 1981, as Western investors switched out of precious stones into high interest rates.

"The economy is not healthy. We are short of money for development and everything else. All that we saved in the good years has been consumed," Mr Mmusi said.

The vulnerability of Botswana's economy has also been underlined by the depression in South Africa caused by the gold slump.

South Africa was Botswana's biggest trading partner. Its mines employ 20 000 people, providing about half of the earnings of formally employed people in Botswana.

Indications that South African mines were cutting back on Botswana labour sent another shudder through the economy.

Officials also suspect South African motives. They are clearly concerned by the atmosphere of violence in the region and tend to point to South Africa as the source.

There was no serious crime in Botswana until

last year when 12 armed robberies occurred, police said. All but one of the robbers were caught and all were South African refugees.

In this year's drought Botswana lost 75 percent of its staple crops of sorghum and maize. More seriously, because it is a cattle country, it might lose half a million head, about 14 percent of the national herd.

President Quett Masire has declared an emergency and has appealed for international aid, which is beginning to flow.

Western diplomats in Gaborone give the President and his Ministers high marks for sound economic management and pragmatic politics and express confidence that Botswana will pull through its crisis. But they said a measure of luck might be needed if the West's recession continued and regional politics remained on their downward spiral.

"Another year of drought would be disastrous," said one. —

## WATER LEVEL DROPS IN VOLTA LAKE

Accra DAILY GRAPHIC in English 3 May 82 pp 1, 4

[Article by Elvis D. Aryeh]

[Text] **DRASTIC** recession has occurred in the Volta Lake, the base of the nation's hydro-electric power, bringing the present maximum retention level of flow of the lake from 276 feet to 251.60 feet above sea level.

The minimum operational level of flow for the generation of electricity is 248 feet above sea level. Any level below the minimum could result in a crisis and power supply cuts to some areas in the country.

The recession has seriously affected the multi-million-cedi Kwahu Ridge Water Project at Kotoso where the lake has drawn back many metres, thereby making it difficult for the pumping of raw water for treatment.

Other areas where the water has receded between 50 and 100 metres are Nketepa, a major fishing village, Adawso Kye-

Amanfro, Torkor, Yeji and Yapei.

At Adawso, which is the major gateway to the Afram Plains, the lake has receded to such an extent that a concrete ramp

constructed as a landing station for ferry crafts has been rendered useless.

When the Volta River Authority (VRA) office at Akosombo was contacted, the public relations officer, Mr John Osei, warned that if the recession of the lake continued, the possibility of running into trouble with the turbines in future could not be ruled out.

He explained that the draw-back of the lake was a "natural phenomenon" owing to persistent delays over the last five years, of the northern rains to replenish lost water and increase the level of flow.

Another attribute is the obvious effects of the endless Saharan drought, he indicated.

Mr Osei however, denied that irrigational activities by food crop farmers along the lake were one of the causes of the recession and said "the amount of water actually taken for irrigation purposes has very little effect".

Owing to the persistent drought which caused a near crisis, he disclosed, the VRA decided in 1978 to invite the Kaiser Engineers from abroad to conduct research on the rainfall belt but fortunately, the rains came.

Mr Osei however stated that for the past four years "we have not come anywhere near our maximum lake retention level of 276 feet above sea level".

To forestall any crisis therefore with the generation of electricity from the Akosombo dam, Mr Osei suggested that "a more serious study in respect of the rainfall pattern will have to be undertaken and steps taken to remedy the situation".

Mr Osei disagreed in reply to a question as to whether the construction of the new Kpong Hydro-Electric Project was probably one of the facts for the recession.

The Kpong Dam, he pointed out, is not fed by rain but by the water released from the Volta Dam at Akosombo.

## SOUTH AFRICA

### BRIEFS

LESOTHO WATER TO SOUTH AFRICA--Lesotho is hoping to sell two of its rivers to South Africa. The controversial plan would involve diverting the rivers to irrigate South African soil. Lesotho Prime Minister Leabua Jonathan says the project would bring his country much needed income but would also make it more dependent on South Africa. Brian Eminess reports: [begin recording] The EEC will pay half, with South Africa putting up the remaining funds. The scheme will consist of five storage dams, three hydroelectric stations and a pumping station with close to 110 km of diversion tunnels. This would entail a pumping rate of [number indistinct] cubic centimeters of water a second. Official sources have claimed that the Lesotho premier has been in close contact with his South African counterpart, and that the Pretoria government is keen for the scheme to go ahead. This is Brian Eminess in Bloemfontein, for Capital news. [Text] [MB071102 Umtata Transkei Capital Radio in English 1400 GMT 4 Jun 82]

CSO: 5000/5758

SWEDISH STUDY: SULFUR EMISSIONS HARMING CENTRAL EUROPE

Stockholm DAGENS NYHETER in Swedish 18 May 82 p 7

[Report by Bo B. Melander]

[Text] Corroded statues and church towers that have been ornaments to Europe for centuries are now falling down. Big forest areas are dying, plants and animal species are disappearing. In Sweden lakes are dying--and soils are becoming acidified.

"Sulfur emissions are the cause of much of this. They must be rapidly halved," researchers say in a Swedish study "Acidification Today and Tomorrow" that was released Monday [17 May].

The study is Sweden's contribution to a conference on acidification in Stockholm in June, 10 years after the UN Environmental Conference of 1972.

The study warns against allowing the damage due to sulfur emissions from power plants, industries, and heating installations to continue. Billions of kronor's worth is destroyed every year.

In the aggregate the emissions can affect the climate. Even today a haze caused by sulfur particles hangs over the Arctic.

Back in 1972 Sweden tried to convince big emissions countries such as the FRG and the United Kingdom that the acidification in Sweden was caused by emissions in those countries.

□ Forests Dying

Today the understanding of the problem is greater in Central Europe, where forests are now dying and old monuments are falling down under the pressure from corrosive acid precipitations.

The United Kingdom is still rather negative toward a restriction of sulfur emissions.

"The problem is solved there with high smokestacks," says Anders Dahlgren, minister of agriculture, who presented the report Monday.

Sweden considers that it has quite clear evidence today that sulfur emissions are doing tremendous damage and must be cut down.

Lakes in western Sweden have had the same sulfur content for 8,000 to 10,000 years, but during the postwar period they have quickly become more and more acid and in several cases died out completely.

Liming does not solve the problem; the emissions must be restricted, according to the study.

Sweden strongly emphasizes that the countries responsible for the emissions also sustain damage. It is also pointed out that heavy metals and other poisons circulate more readily in the environment when sulfur is added.

□ Only the Tip

"What we see today is probably only the tip of an iceberg of environmental problems surrounding sulfur," comments Göran Persson, chairman of the committee's group of experts.

He states that there are techniques today for desulfurization and that a reduction could come about in 10 years, a reduction to half of today's emissions.

"It would mean about a 3-percent higher oil price. But, unfortunately, such a quick solution is not a realistic prospect. The important thing is for the emissions to be gradually decreased."

It is pointed out that it is important for the emitting countries to have common guidelines and laws and for the problem to be solved jointly.

Now in June a number of experts from various parts of the world are meeting in Stockholm to discuss the problem. After that will come the hard work of interesting the politicians of Europe in measures to be taken at the conference of ministers in Geneva.

But however eager Sweden is to speed up the work on reduced emissions, the statements in the study indicate a realization that the economic obstacles are great.

"But it is the causes of acidification that must be attacked. There is no other way," the study states.

8815

CSO: 5000/2122

## BELGIUM

BELGIUM HAS WORST ECOLOGY RECORD IN EEC

Brussels LE SOIR in French 28 Apr 82 p 2

[Article by B. V.: "Belgium, 36 Times Last in Ecology"]

[Text] Belgium, paradise of the polluters? Undoubtedly, as our country is the last in the European Community in the area of ecology. INTERENVIRONNEMENT WALLONIE has just irrefutably proven the Belgian lack of goodwill through stunning figures. Eighteen European directives concerning the environment are not being implemented by Belgium. The same is true for 18 international conventions. In total, Belgium contravenes 36 international obligations relative to sea, fresh water and air pollution, to toxic and dangerous wastes and to the protection of nature.

Last February, Belgium had already been designated as the "bad student of the green class." As a matter of fact, the European Court of Justice has condemned it for non-implementation of six European directives on water protection and waste management. These directives, a kind of European law enacted unanimously by the Council of Ministers of the Ten, must imperatively be retranscribed into national legislation within a certain period of time. Which was not done by Belgium. And these 6 condemnations could well be followed by 12 other calls to order.

Among the 10 members of the EEC, Belgium has accumulated the largest number of violations. This appalling delay is all the more embarrassing as our country is currently, and until the end of June, presiding over the Council of Ministers of the Community.

Garbage Can of EEC

In addition to our international credibility, this negligence could have serious consequences. We run the risk of becoming the garbage can for neighboring pollution because of the current legal void. INTERENVIRONNEMENT WALLONIE noted that industries in neighboring countries often come unload their wastes in our country. An example: 99 percent of organic chlorinated wastes end up in Antwerp to be incinerated at sea... The Belgian "omissions" also have negative economic effects. Unlike our neighbors, our country has never developed a program for the reprocessing of used oils, a new industrial recycling sector.

Belgium seems particularly uninterested in two areas among the international conventions. Sea pollution, specifically by hydrocarbons: we will probably have to wait for a flagrantly serious oil slick to occur before the conventions will be ratified and the implementation decrees issued. The protection of nature: neither the animal and plant species threatened with extinction, nor the wild birds retain the attention of our leaders...

#### Why Not the Regions?

"We are not asking our officials to show imagination," stated INTERENVIRONNEMENT WALLONIE, "we are only asking them to implement the existing European directions and international conventions." And the timid attempt made by Mr Firmin Aerts, secretary of state for environment, is totally inadequate. Indeed, he has confined himself to having the Council of Ministers, which met on 12 March, approve 5 European directives. But the gap to be filled is much more significant...

Finally, if the national government does not meet its obligations, it would be perfectly possible for the Walloon authorities, which have responsibility in matters of environment, to take the initiative and to transcribe the European directives into internal regional law. This is what the Flemish Council did by adopting an enabling decree relative to waste management. Thus, the regions could put themselves straight with their international obligations, while the national government would remain in violation... On the condition that there is a Walloon will to do "green" work.

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CSO: 5000/2111



GOVERNMENTAL ANTIPOLLUTION MEASURES DEEMED INADEQUATE

Athens EPIKAIRA in Greek No 720, 20 May 82 p 19

[Text] The reality called "Cloud" [pollution] was tough on the government last week. The implementation of the measures that the YXOP [Ministry of Urban Planning, Housing and Environment] had been working on for 6 months has not borne fruit, as is apparent from the bulletins issued by the center for antipollution. Athenians only breathed again more freely thanks to the prevailing winds.

However, this last and most serious episode of atmospheric pollution also had some "positive" aspects, in the sense that it contributed toward clearing up some confusion on the subject.

Actually, the zero effectiveness of the measures that were gradually applied proved that the government is struggling to solve a problem whose identity remains an unknown.

Thus, first of all, the measures taken against the use of private vehicles proved themselves, beyond the shadow of a doubt, totally fruitless to combat the "cloud" and only contributed to a certain traffic decongestion in the center of town.

Moreover, the restrictions imposed on some tens of industrial plants from the 13,500 that exist in the Attiki region, while on the one hand being impossible to control (as the survey conducted by the Ministry of Industry clearly confirmed), also reveal a haste which, instead of solving the problem, only diversifies it: indeed, the subject is not the restriction of industrial activities, but their correct operation in a first phase with a subsequent redistribution within the available space.

As a result of these tactics, Greek industrial units remain isolated from antipollution technology such as control of fuel, filters, etc. Their move to other less vulnerable areas remains a vague "future" in a dim velleity.

Thus, to face the problem on the basis of the "closing down"--periodic or definite--of industrial plants only forebodes an increased burden of the social costs of the pollution. And it is unthinkable to solve a problem by creating another.

## GREECE

### DRASTIC MEASURES TAKEN TO REDUCE POLLUTION

Athens TA NEA in Greek 12 May 82 pp 1, 4

/Excerpts/ Stricter measures will in all probability be put into effect tomorrow to combat pollution. Included among these measures will be the closing off of the center of Athens to private vehicles, a 40 percent cutback in fuel consumption by 71 privately-owned industries, restriction of truck traffic and a 2-hour reduction in public services personnel work schedules during the morning hours. Today, only automobiles with even-numbered tags will be permitted to circulate in the greater Athens area.

Moreover, this week, the Ministry of Urban Planning is expecting to receive an answer from industrialists to its proposal that one-third of the industries (about 1,500) close down every summer month to significantly cut down on pollution. The closing down of these industries for 1 month will be coordinated with the annual leave of the personnel. The Ministry of Urban Planning announced that if the answer is affirmative, then the measure could go into effect on 1 June. For those few industries which perhaps cannot close down, special arrangements that are now being studied will be implemented. This measure will be coordinated with the implementation of a graduated work schedule in the public services and subsequently in shops.

Yesterday, pollution affected the lives of the residents of Athens, particularly those with heart and respiratory ailments.

Many cases of fainting were recorded and out-clinics received more than the daily number of patients.

#### New Measures

The second series of special measures that "if needed will be announced in detail today" will be the following, in accordance with the government announcement of 15 January:

## Industries

- An added 10 percent reduction (total reduction by 40 percent) in production and fuel consumption by privately-owned industries.
- Suspension of work by certain categories of industries which, from their nature and location, create a serious problem and for which there are no special problems in production procedures (foundries, brick plants, lime kilns, quarries, etc.).

## Vehicles

- Prohibition of circulation of a certain number of government, public and social welfare organization vehicles.

Moreover, the hours trucks will be permitted to circulate in the "blue zone" will be only those that trucks over 4 tons are permitted, namely 2200-0630 and 1500-1700.

Also included are the following:

- Significant cutback in construction and excavating work.
- A decrease by at least 2 hours in the work schedules of personnel in the public services, NPDD /Legal Entity of Public Law/ firms, social welfare organizations, banks and other such services controlled by the state and adjustment to the desired traffic conditions.

## Public Prosecutor's Office

Those industry officers who refuse to abide by the special pollution measures or who attempt to deceive Ministry of Industry teams conducting inspections will be brought before the public prosecutor's office.

The above information was provided by the Ministry of Industry yesterday and, as was made known, a revision in the relative legislation is already being studied so that both administrative and penal sanctions might be imposed on enterprises and company officers brought before the courts.

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CSO: 5000/5327

GREECE

BRIEFS

RAIN, HAIL PELT GREVENA--Salonica, 15 May--Bad weather has brought about a catastrophe of Biblical proportions in the Grevena Nome, where heavy rains and hail have pelted the region. Damage to agriculture has reached the 100 percent mark (wheat, tobacco and grapevines have been especially hit) in the villages of Amygdalies, Oropedion, Rodia, Elevtheron, Milea, Kivotos, Agios Georgios, Kokkinia, Vatolakkos and Taxiarkhis. The heavy rains that fell over most of the nome destroyed 250 mts of the Grevena-Kozani highway at the "Pigi Kamilas" locality near the village of Kokkinia. [Excerpt] [Athens TO VIMA in Greek 16 May 82 p 1]

CSO: 5000/5329

UNITED KINGDOM

BRIEFS

RESEARCH ON 'ACID RAIN' HALTED--The British government is cutting down on all research on air pollutions, and the Ministry of the Environment is discontinuing contributions to research on sulfur emissions. Outstanding British researchers are insisting that the cutbacks will make the United Kingdom's negotiating position vis-à-vis the European countries on laws against emissions difficult, according to the English scientific periodical NEW SCIENTIST. The Scandinavian countries, which assert that the United Kingdom's emissions contribute to the acidification of soil and water, will see the decision as a British no to reduced emissions. When the ministers of the environment meet in Stockholm in June on acid rain it is already expected that the United Kingdom will not promise reduced sulfur emissions. Research on the United Kingdom's traditional "smog" problem is also considerably affected by the cutbacks.  
[Text] [DAGENS NYHETER in Swedish 21 May 82 p 7] 8815

CSO: 5000/2122

END

## NEW ZEALAND

- Christchurch Plans Campaign to Reduce Air Pollution  
(THE PRESS, 30 Apr 82) ..... 21

### Briefs

- Lead Poisoning Research Urged 22

## PHILIPPINES

- Factories Pollute Ilog Banadero River  
(E. T. Suarez; BULLETIN TODAY, 17 May 82) ..... 23

## SRI LANKA

- Committee on West Coast Erosion Established  
(DAILY NEWS, 12 May 82) ..... 24

## EAST EUROPE

## ALBANIA

- Pollution From Industrial, Agricultural Units  
(Faik Toska; ZERI I POPULLIT, 12 May 82) ..... 25

## MEXICO

### Briefs

- Volcano Deaths Total 98 27

## NEAR EAST AND NORTH AFRICA

## PERSIAN GULF AFFAIRS

- Air, Water Pollution Measures  
(Philip Moore; GULF MIRROR, 24 Apr 82) ..... 28

## BAHRAIN

### Briefs

- Possibility of Rationing Water 29

## ISRAEL

- Palestinian Study Offers Various Statistics on West Bank Water Use  
(SHU'UN FALASTINIYAH, May 82) ..... 30

## SUB-SAHARAN AFRICA

### BOTSWANA

- Drought Kills Crops, Cattle, Economy Ruined  
(THE CITIZEN, 24 May 82) ..... 60

### GHANA

- Water Level Drops in Volta Lake  
(Elvis D. Aryeh; DAILY GRAPHIC, 3 May 82) ..... 62

### SOUTH AFRICA

- Briefs  
Lesotho Water to South Africa ..... 63

## WEST EUROPE

### INTERNATIONAL AFFAIRS

- Swedish Study: Sulfur Emissions Harming Central Europe  
(Bo. B. Melander; DAGENS NYHETER, 18 May 82) ..... 64

### BELGIUM

- Belgium Has Worst Ecology Record in EEC  
(LE SOIR, 28 Apr 82) ..... 66

### GREECE

- Governmental Antipollution Measures Deemed Inadequate  
(EPIKAIRA, 20 May 82) ..... 68

- Drastic Measures Taken to Reduce Pollution  
(TA NEA, 12 May 82) ..... 69

- Briefs  
Rain, Hail Pelt Grevena ..... 71

### UNITED KINGDOM

- Briefs  
Research on 'Acid Rain' Halted ..... 72

GIPPSLAND AREA SAID TO SHOW EFFECTS OF PESTICIDE SPRAYING

Strange Deaths of Five

Melbourne THE AGE in English 24 Apr 82 pp 1, 4

[Article by Stephen Foley]

[Excerpts] Five Victorian Lands Department workmen involved in the extensive spraying of herbicides in Gippsland have died from cancer or sudden heart attacks in the past three years.

About six other spray workers who suffered serious illnesses have received compensation from the State Government.

Lawyers for the Australian Workers' Union believe all the cases are linked to the chemicals 2,4,5-T and 2,4-D--the ingredients of the defoliant Agent Orange used in Vietnam. The chemicals are among the herbicides used by the Lands Department for the past 30 years.

An AWU official in Sale, Mr David Farrar, said: "We cannot say conclusively that they are poison-related, but there are problems when perfectly healthy guys suddenly keel over."

The new Minister for Forests and Lands, Mr Mackenzie, said yesterday that he was very concerned to learn of the workmen's deaths, and would investigate the matter.

He said he had always been opposed to the use of herbicides, and foreshadowed moves to stop or curb their use in Victoria. "It has been my attitude on the information I have obtained that there is enough doubt there to stop the use of herbicides until such time they are proven perfectly safe."

He said he hoped to discuss with his department officers soon the feasibility of ceasing herbicide use. "The ALP policy is to stop the use of it, and it is my intention to adhere to Labor Party policy," he said.

Mr MacKenzie said he wanted controls over both Government and private use of 2,4,5-T and 2,4-D and the promotion of alternative ways of combating noxious weeds. "I have serious concerns about the indiscriminate use of herbicides," he said. "I am concerned that they are given to people not experienced in their use, who may be using them in the air streams."



He would consider providing more money to the Keith Turnbull Research Institute to further research an alternative to herbicides. The institute is experimenting with biological methods of controlling weeds and blackberries.

Illnesses among about six Lands Department employees exposed to the sprays have been the subject of compensation claims. According to the AWU's solicitor, Mr Michael Arnould, all but one of the cases was settled out of court. Therefore there was no Workers' Compensation Board ruling on the cause of illness.

"In each case the Lands Department made a denial of liability, but they agreed to pay medical expenses and lost wages," he said.

Mr Arnould said both sides retained the right to pursue the claim further if the employee's condition grew more serious.

- The Lands Department makes special payment to those engaged in herbicide spraying. Workers directly exposed to the spray receive an extra 33 cents an hour while those working nearby get 27 cents an hour. According to

union officials it is "danger money".

- A State Liberal Government ban on the use of 2,4,5-T near built-up areas after a controversy over cluster birth deformities in the Yarram area in the mid-1970s is still in force.

However, the Vermin and Noxious Weeds Destruction Board, the chemical spray arm of the Lands Department, said it had no control over the herbicides it sold to private land owners. A board member, Dr William Parsons, said sales of 2,4,5-T and 2,4-D were worth about \$1 million to the department last year.

- The drift from heavy spraying of herbicides is blamed for the defoliation and deaths of trees, and for stock deformities, in a valley near Yarram.

- Figures released by the Lands Department on Ministerial authority show that in its chemical spray programme last year the department used 18,000 kilograms of 2,4,5-T and 35,000 kilograms of 2,4-D. In the same period the department sold 21,500 kilograms of 2,4,5-T and 128,000 kilograms of 2,4-D to the public.

### 'Vietnam-Like' Wasteland

Melbourne THE AGE in English 26 Apr 82 pp 1, 15

[Article by Stephen Foley]

[Excerpts]

A welcoming sign at the gateway to Yarram, in the butter and cream belt of Gippsland, boasts of the district's unspoiled charm.

But not far away, across the thick pine forests, lies the secluded Hiawatha Valley where other signs show that all is not well — dead trees, dying vegetation and an absence of bird life.

For more than 20 years the Lands Department has conducted a programme of herbicide spraying in Hiawatha Valley, using, among other chemicals, 2,4,5-T and 2,4-D, components of the military defoliant Agent Orange.

As a result of the spraying, residents claim a picture book setting in the Strezleckis has become a microcosm of what took place in South Vietnam.

The spraying has continued here, as in other parts of the State, in an attempt to control blackberries and weeds such as ragwort.

Around Yarram, which was at the centre of a birth deformity scare four years ago, the controversy has been renewed by a small group of women who say the drift from continued spraying is destroying their haven in the mountains.

They claim the volume of chemicals poured on to Crown Land bordering their properties has defoliated and killed trees and taken its toll of stock.

Some of the cattle grazing in the area suffer deformities and owners say that abnormally high numbers of stock have had to be destroyed due to paralysis and unexplained sickness.

A former resident of the valley, Mrs Joan Osborne, speaks of the time when the birds made a din in the trees outside her bedroom window each morning.

Today, the two towering trees that shaded their old farmhouse are stark skeletons.

And the willows are nowhere to be seen. Now they are no more than images in Mrs Osborne's old snapshots.

Another resident in Hiawatha Valley, Miss Rene Woollard, is a fiercely independent and, to her detractors, somewhat eccentric spinster. She led the way to her tangled garden and pointed to the exaggerated growth of a mahogany gum.

Its branches were splayed and contorted.

Next to it, the top half of an English yew was dying.

Miss Woollard reached up and picked a handful of sickly leaves, crinkling at the edges. She indicated several brown spots: "That's where it was hit by the drift. It is funnelled into this valley by the air currents — it's completely uncontrollable," she said.

'Miss Woollard's three-roomed home sits half-way up the slopes of the valley, obscured from the road by a tangle of blackberries.

She has been an indefatigable fighter for the abolition of herbicides for 15 years, a stand which she says has isolated her from much of the farming community.

"People refer to me as 'that silly old duck up in the mountains' but I'm not afraid," she said.

Miss Woollard, whose farm upbringing taught her to be cautious with all poisons, became concerned about chemical sprays when she saw the effect it was having on her sheep and cattle.

It's all written down in an old

ledger book: the spastic calves, the 15 cows she had shot by a neighbor because of calving paralysis, the deformities too distasteful to mention.

However, Dr Bill Parsons, a member of the Vermin and Noxious Weeds Destruction Board, who has visited the valley, said: "There's no way the drift from those phenoxy herbicides would kill those trees.

Joan Osborne said that when her family first settled at Stacey's Bridge, the Lands Department threatened to prosecute farmers if they did not spray with 2,4,5-T or 2,4-D.

But after using Lands Department equipment to spray grass on their property, the Osbornes became suspicious when their cows did not become pregnant.

In their last winter at the farm, they lost 100 of their dairy herd. The cows suddenly contracted an unknown illness.

Both Miss Woollard and Mrs Osborne said 2,4,5-T and 2,4-D were often mixed far stronger than recommended.

"It was left to unskilled people who just swished it around as if it was water," Miss Woollard said.

Mrs Osborne added: "The Crown Land at the back of our home must have been sprayed as strongly as Vietnam to defoliate and kill the huge gums."

The irony was that throughout the spraying campaigns, year in, year out, the ragwort continued to grow.

Between 1975 and 1976, a number of babies were born with

major deformities soon after the Yarram district had been sprayed from the air with 2,4,5-T and 2,4-D. The babies died. Two doctors found that the frequency of neural tube disorders was 10 times the world rate. They found the Yarram abnormality rate among living children was at least twice the national average.

In March, 1978, following a controversy over the deformities, the then Minister for Health, Mr Houghton, announced an inquiry which found no evidence linking the birth defects and herbicides spraying.

But scientists and doctors who took a close interest in the inquiry criticised it for a lack of thoroughness. The report said the malformations did not suggest a specific local cause. It also said that three abnormal babies among 93 deliveries at Yarram was a one in 500 probability which could happen by chance.

An ACTU-Trades Hall Council occupational health and safety unit report on the use of 2,4,5-T and 2,4-D, released last year said:

"It is necessary to point out that the data analysed in the Yarram Report are mortality rather than incidence data. There is, as yet, no systematic collection of incidence data on such abnormalities throughout Australia.

"Further, as the majority of malformed fetuses are aborted, spontaneous abortions must be considered simultaneously with the numbers of live-born malformed children if credible judgments are to be made. The Yarram Report fails to recognise the importance of abortion information and consequently exempts it from analyses and conclusions."

## Opposition to Ban

Melbourne THE AGE in English 26 Apr 82 p 15

[Article by Paul Chadwick]

[Excerpts]

Farmers and the chemical industry will fiercely oppose moves by the Victorian Government to end the use of some herbicides.

Bans on the chemicals 2,4,5-T and 2,4-D would cost agriculture tens of millions of dollars in lost production, the president of the pastoral division of the Victorian Farmers and Graziers Union, Mr Des Crowe, said yesterday.

All primary products would be affected, but grain would be worst hit, he said. There could be shortages of some grain-based products on the domestic market and there would be a drop in export earnings, he said.

Mr Crowe was commenting on a report that the Minister for Forests and Lands, Mr Mackenzie, planned to discuss with his department's officers the feasibility of ceasing the use of the herbicides.

Statistics about the extent of pesticide use in Australia are imprecise and scarce. A Federal Government report last year estimated that between 2000 and 3000 tonnes of 2,4-D were used annually "in a wide variety of formulations to cater for the widely different uses".

The Commonwealth pesticides co-ordinator, Mr Jack Snelson, said yesterday that herbicides were worth about \$100 million a year to retailers and about \$500 million a year to users in the improved yields that followed pest control. Australian States were unanimous "that there are no reasons whatsoever to restrict the use of 2,4-D and 2,4,5-T" from a scientific and administrative point of view, he said.

The Victorian Lands Department alone has been estimated to sell about \$1 million worth of chemicals to private users each year.

CSO: 5000/7541

LAX LAWS ALLOW IMPORTATION OF DANGEROUS PESTICIDES

Melbourne THE AGE in English 27 Apr 82 pp 1, 3

[Article by Peter Ellingsen]

[Text] Inadequate Federal laws mean smugglers can import dangerous chemical pesticides from abroad to the NT and the ACT, then ship them into the States, where they are prohibited.

In the six States, a pesticide must be registered with the State Department of Agriculture before it can be used. But in the Northern Territory and the ACT, there is no requirement for registration under their Federal laws.

People can bring the prohibited pesticides into Australia legally through the NT or the ACT, then run them across the borders into the States.

In at least one case, it is known that a pesticide prohibited by the States was imported through Darwin and used, illegally, to control insects in another State. One expert in the field has given THE AGE details of the case.

Experts say the prohibited chemicals are considered too dangerous to be used and are banned in many developed countries.

According to a letter written earlier this month by the secretary of the Premier's Department, Mr Ken Green, the Prime Minister, Mr Fraser, is concerned about the loophole and is working to have it closed. The chief of Victoria's agricultural chemistry division, Mr Bob Belcher, is also trying to have the matter rectified.

"I have made very strong representations to get this loophole closed," he said. Mr Belcher said allegations had been made that prohibited pesticides were being landed in Darwin then shipped to Victoria, where they were being used illegally. He said he had not yet been able to substantiate these claims.

According to the Commonwealth coordinator of pesticides, Mr Jack Snelson, the loophole is not being widely exploited. "It happens so seldom," he said.

Mr Snelson said he had been waiting for eight years to have registration of pesticides made mandatory in the territories.

The loophole is just one of several weaknesses in Federal and State attempts to control dangerous pesticides and herbicides.

According to Mr Peter Rawlinson, senior lecturer in zoology at La Trobe University, legislative safeguards, particularly in regard to aerial spraying, are ineffective.

"Controls on aerial spraying as far as public health is concerned are non-existent," he said. "The only checks that are there are to protect the agriculture."

Mr Belcher agrees. "There is no doubt the original act is designed to protect agriculture, not people, from certain herbicides," he said. "I would like to see stronger controls on agricultural chemicals."

It is not only farms that get sprayed. A crowd at the Leongatha drive-in was sprayed with a fungicide in January 1979. According to Mr Rawlinson, the 200 patrons complained of irritation to the eyes, ears and nose but the pilot had not breached the Aerial Spraying Control Act and so no charges could be laid.

"While it is illegal to spray 2,4-D or 2,4,5-T within eight kilometres of a susceptible crop, it is legal to spray immediately adjacent to houses and towns," he said. "Accidental or deliberate spraying of human habitation does not constitute an offence under the act."

Last year a Gippsland farming family was accidentally sprayed with 2,4-D and family members now claim to have recorded levels of the herbicide in their blood and urine.

The family does not wish to be identified because of the controversy surrounding aerial spraying of herbicides, and the strong emotions it raises in farming communities. "It is a volatile question here--a lot of people feel spraying is necessary to maintain an economic farm," one of the family said.

According to Mr Rawlinson, tests in Sweden, Canada and the US have established a link between exposure to 2,4-D and 2,4,5-T and a high incidence of soft-tissue cancer.

He said the common practice of low-volume spraying in Victoria, where the herbicides are used in a highly concentrated form, only increased the risk to health.

The deputy director-general of agriculture, Mr Bob Taylor, says there have been problems with aerial spraying, but believes these can be overcome by self-regulation. "There have been mistakes, but the public is now putting a lot of pressure on the industry," he said.

CSO: 5000/7542

# HEALTH RISK SEEN IN SEWAGE POLLUTION OF SEA OFF SA COAST

Canberra THE AUSTRALIAN in English 21 Apr 82 p 3

[Article by Peter Blunden]

[Text]

A MAJOR health risk was posed by a strike which had caused millions of gallons of raw sewage to be poured into the sea off Adelaide, the South Australian Government warned yesterday.

Concern centres on pollution in the Gulf of St Vincent and on the simultaneous severing of power supplies to laboratories monitoring dangerous bacteria in the State's water supplies.

The Government confirmed yesterday that the State Water Laboratories were no longer able to test for the deadly organism responsible for amoebic meningitis — a water-borne disease that killed a 10-year-old boy at Whyalla early last year.

The Minister of Water Resources, Mr Arnold, said the health of thousands of people in the north of the State was at risk.

"The incubation temperatures needed to isolate the deadly organism can not be maintained at the laboratories," Mr Arnold said.

## MEETING

He also warned people to stay clear of the sewage discharge area, behind Torrens Island, north of Adelaide.

The strike by sewage workers — members of the Federated Engine Drivers and Fire-

mens Association — has shut down the Bolivar Treatment Werks, north of Adelaide, and resulted in millions of gallons of raw sewage flowing into the gulf.

Mr Arnold last night attacked the strikers for their "unwarranted and irresponsible action".

An urgent meeting was convened late yesterday by the Public Service Board in an effort to resolve the dispute over improved conditions.

At the same time, the Department of Water Resources is continuing efforts to carry out a limited program of testing for bacteria in water supplies.

The sewage discharge has also seriously alarmed fishermen, and the State's Department of Fisheries was late yesterday examining the situation.

Mr Arnold said a federal package of wages and conditions had already been agreed to by the union for all FEDFA employees in State employ.

"This agreement provided for no extra claims for 12 months, but operators at Bolivar made extra claims," he said.

"When these were refused, the operators walked off the job."

The dispute could delay ratification of the agreement by the Full Bench of the Arbitration and Conciliation Commission, and thereby disadvantage other union members, Mr Arnold said.

COMPULSORY REGISTRATION OF ALL HAZARDOUS WASTE PROPOSED

House Committee Report

Melbourne THE AGE in English 30 Apr 82 p. 3

[Article by Simon Balderstone: "Report Slams Waste Disposal"]

[Text] Canberra.--The storage, transport and disposal of millions of litres of hazardous chemical wastes is generally unregulated and often unsafe, according to the House of Representatives standing committee on environment and conservation.

The committee recommended that if State Governments failed to introduce effective waste disposal strategies by 1985, the Commonwealth should legislate to control hazardous wastes "to the fullest extent of its power."

It also recommended that if the State Governments failed to incorporate the Australian Code for the Transport of Dangerous Goods by Road and Rail into legislation by 1985, the Commonwealth should legislate to enforce it too.

The committee found that incidents involving improper disposal of hazardous wastes included:

--Drums of waste illegally dumped on non-municipal tips had exploded, killing or injuring tip workers and damaging machinery.

--Several hundred badly corroded drums of combustible waste were used for traffic barriers at a drive-in cinema in outer Melbourne.

--Oil contaminated with polychlorinated biphenyls disposed of on-site by a junkyard found its way into Edwardes Park Lake, Reservoir. The lake contains very high residue levels of polychlorinated biphenyls, particularly in the sediments.

The committee found that the present regulation of hazardous, long-life radioactive waste was inadequate. In New South Wales and Western Australia, there had been recent discoveries of radioactive waste from sandmining being improperly disposed. Houses, schools and shops had been built on top of the waste.

The chairman of the committee, Mr Hodges (Lib, Qld), said that despite the fact that the radioactivity of the waste had been known of for a long time, the lack of effective control over its disposal had resulted in individuals being "unnecessarily and insidiously exposed for considerable periods."

The committee also found that arrangements within and between the States for disposal of chemical wastes was fragmented and lacked uniformity. "At the Commonwealth level, the situation is no better," he said.

"Several Commonwealth departments and authorities approached by the committee were unaware of their responsibilities concerning hazardous chemicals."

Mr Hodges said yesterday that much of the hazardous chemical waste produced in Australia was being dumped illegally. He said that during its inquiry into hazardous chemicals, the committee had been so alarmed by hazardous waste disposal practices in some States that it had decided to make a separate report on the adequacy of disposal facilities and procedures ahead of the main report.

Although New South Wales and Victoria had made considerable progress in providing regulations and facilities for the disposal of hazardous waste, "some other States behave as though these hazards do not exist," he said.

The bi-partisan committee was particularly critical of the Queensland Government, and said the official liquid waste disposal facility at Willawong, Brisbane, was a disaster.

Outside NSW and Victoria, basic information was lacking on the types and quantities of hazardous waste being generated. "As such information is the starting point for attacking the problem, the outlook for most States, in the short-term, is bleak," Mr Hodges said.

A member of the committee, the Opposition spokesman on environment and conservation, Mr West, said Australia had been lucky not to have experienced an environmental disaster such as that at Love Canal, near Niagara Falls, where toxic wastes dumped into an abandoned canal had led to large numbers of miscarriages, birth defects, respiratory problems and nervous breakdowns among people living near the dump, and the eventual evacuation of 239 people.

He said Australia had no compulsory controls over the introduction of chemicals for commercial and industrial use. Most State laws governing their use, transport and ultimate disposal were disparate and inadequate.

Another main recommendation of the committee was for the Commonwealth to seek the views of the States and the Northern Territory on the question of a single national incinerator. The committee said the Federal Government should approach the NSW Government to get national access to the high-temperature incinerator (for very toxic waste) in Sydney.

The committee found that:



--Chemical waste disposal facilities were generally inadequate or non-existent;

--A lot of hazardous waste was stored usually in steel drums on industrial sites, until satisfactory disposal methods were developed;

--There was a high probability that some material which should be stored was being improperly disposed of or illegally dumped.

--There had been an unnecessary build-up and storage of toxic waste. Waste for which there was an acceptable disposal method should not be stockpiled unnecessarily.

--Waste had been stockpiled for a number of years, and it was increasingly likely that some of these drums were corroding and would leak.

The committee recommended that the Department of Defence test ground and surface water flowing from World War II chemical weapon storage and disposal sites for the presence of chemical "leachgate."

Other recommendations included:

--Hazardous wastes which could be reprocessed economically were not to be used as land fill or incinerated unless required as a source of energy for incineration.

--The development of standards for the safety of waste disposal sites after closure, including appropriate future uses.

#### Radioactive Tailings Suit

Melbourne THE AGE in English 30 Apr 82 p 5

[Article by Dierdre Macken]

[Text]

SYDNEY. — The New South Wales Health Commission may consider legal action against a sand-mining company after an investigation which showed there were unacceptable radiation levels in 24 houses, part of a hospital, a public school, baby health care centre, and playing field at Byron Bay on the NSW north coast.

The commission will consider action to recover costs of cleaning up the area if the company does not meet them.

Previous tests in the Byron Bay area had shown that only a few houses, part of a school and some railway land were high in radioactivity, but recent tests have shown that the after-effects of sand mining are much more widespread.

The Director of Public Health, Dr Allen Crawford, will go to the area today to oversee a big excavation programme, which will involve demolishing at least one house and part of a hospital.

Already two areas of land have been cleared and a portable classroom removed so that the tailings from sand mining containing radioactive thorium could be removed.

The Health Commission has asked the company to clean up the tailings from 40 years of sand mining, but if the company, Associated Mineral Consolidated, is unwilling, the commission will consider taking legal action to recover the cost of cleaning up.

The NSW Minister for Health, Mr Brereton, said: "Measures should have been taken to guarantee that radioactive material

would not pose a danger to the public. Over the years sand mining companies have made considerable profit from their activities and I now believe they have a moral responsibility to resolve this problem.

"The company should guarantee that they will meet all the costs involved in this clean-up operation."

Associated Mineral Consolidated mined sands in the Byron Bay area from 1934 to 1975. Today the company will end all operations in Byron Bay to concentrate its mining operations in Western Australia.

The radioactivity arises from a sand product called mineral monazite, which contains radioactive thorium and which was dumped in the area of the town after the mining process had finished.

Mr Brereton said that of the 30

buildings contaminated by the radioactive material, some had two to three times the acceptable level of 0.1 millirems per house. Previous studies have shown some areas in the town have between four and 44 times the acceptable levels.

The removal of the contaminated tailings had already begun but the operation will be accelerated under the direction of Dr Crawford.

Last night, the Health Commission had not heard whether the company was prepared to pay the cost of excavating the 30 other sites and 'The Age' could not contact any executives of the company.

But Mr Brereton said: "If they are not willing to compensate the people affected then I will examine what means are available to ensure that they do."

#### Criticism of Facility

Brisbane THE COURIER-MAIL in English 30 Apr 82 p 3

[Article by Wallace Brown]

[Text] Canberra.--The disposal of hazardous chemical wastes in Brisbane is appalling and gives grave cause for concern, according to the House of Representatives standing committee on environment and conservation.

Both the Queensland Government and the Brisbane City Council are criticised in the committee's report, tabled in Parliament yesterday by its chairman, the deputy Liberal whip, Mr Hodges (Lib, Q.)

Mr Hodges said: "The situation at the Willawong disposal area (between the suburbs of Acacia Ridge and Inala) can only be described as a disaster."

The report says toxic wastes are escaping from the site into nearby creeks--one appropriately named Blunder Creek--which flow into the Brisbane River.

Evidence had been given to the committee that much of the waste would remain toxic for several hundred years.

The report says: "The committee was appalled by the Willawong operation and the continued lack of effective control by the state government and the city council.

"It is essential that effective waste disposal strategies be developed as a matter of urgency at the national level with the participation of state, territory and commonwealth governments.

"Proper disposal facilities alone are not the answer to the problem.

"A comprehensive strategy with adequate penalties to back it up is required to ensure wastes are safely handled at all stages from generation to disposal."

Mr Hodges said the committee had inspected landfill waste disposal facilities at Castlereagh in Sydney, Tullamarine in Melbourne, Canning in Perth, and Willawong.

He said: "While New South Wales and Victoria have made considerable progress in providing regulations and facilities for the disposal of hazardous wastes, some other states behave as though these hazards do not exist."

The opposition environment and conservation spokesman, Mr West, who is a member of the committee, told Parliament: I found the evidence at Willawong, as given by ex-employees and chemists, incredible and unbelievable.

The state government completely reneges its responsibilities to the Brisbane City Council and they attempt to carry out an operation which should be under the jurisdiction of either the State or Federal Government.

Major points made in the report about Willawong include:--

--The contract under which Willawong is operated for the Brisbane City Council prohibits the disposal of hazardous wastes at the plant but does not define what is meant by the term.

--Wastes that are unsuitable for the most well-controlled landfill, such as polychlorinated biphenyls (PCBs) and cyanids, are being dumped at Willawong.

--Their illnesses include kidney malfunction, blood disorders and possible liver disease.

--It would appear that some intractable wastes from outside Queensland have been taken there for easy disposal.

--Two distinct operations are conducted at Willawong to dispose of the estimated 27-36 million litres of liquid wastes received each year. In one, aqueous wastes are treated to remove solids and the remaining liquid spray-irrigated and evaporated.

--This method is used for approximately two-thirds (18-24 million litres a year) of the total liquid waste, an apparent hazard potential.

--In the other operation the other third of the total wastes (9-12 million litres a year), which is mainly nonaqueous, is buried in trenches. Most of this waste is hazardous and some is very hazardous.

--Hazardous liquids are put into trenches dug in ground comprising layers of sand and clay. The ground is retrenched after several months and after previous material has leached away.

--The ground into which the waste is poured has been used, between one and three years earlier, for nightsoil disposal.

--Hazardous wastes include oil, solvents, paint sludges, organic chemicals, thick animal and vegetable sludges, acids, alkalis and toxic industrial wastes.

--Disposal charges are set by the Brisbane City Council and are a quarter of the charges in Sydney and Melbourne. The revenue from these low disposal charges does not permit adequate treatment by the company operating the site.

--Largely because the owners of the disposal plant are industrial cleaners and waste carriers themselves, carriers delivering waste to the dump are unwilling to disclose the generators of, and therefore the nature of the waste.

--Willawong Liquid Waste Disposal Pty Ltd is owned by Berkeley Sanitation Services (51 percent) and Greasetrap Cleaning Service (49 percent) with Greasetrap Cleaning Service being the largest liquid waste-tanker operator in Brisbane.

--As there is limited knowledge of the nature of the waste dumped, little or no treatment is possible and near fatal incidents have occurred. Loads are often mixed, making treatment more difficult.

--The operators of Willawong were not aware, until informed by the committee, that waste from a battery factory, inspected earlier in the day by the committee, contained lead. They believed the waste to be just acid.

In Brisbane, the Lord Mayor, Alderman Harvey, said the problems of the Willawong dump had been well known for two years.

He said as soon as the council realised liquid wastes were seeping into nearby Blunder Creek, the Water Quality Control Council was advised.

Willawong would be closed as soon as possible. The council was doing everything it could to minimise the health risks.

He expected Willawong would reach its capacity by the end of this year.

Liquid wastes from local authorities throughout southeast Queensland and from as far away as Maryborough were dumped at Willawong.

"It is more of a regional problem than a council problem," he said.

The State Health Minister, Mr Austin, said last night he was satisfied department regulations governing the Willawong operation were satisfactory.

"It's easy for the Federal Government to criticise local authority operations, but all three levels of government need to be involved in what is a national problem of waste disposal," he said.

## Perth Situation

Perth THE WEST AUSTRALIAN in English 30 Apr 82 p 4

[Article by Trevor Gilmour]

[Text] Canberra: A major committee of the Federal Parliament has warned of a possible threat to public health in Perth resulting from contamination of ground water supplies by waste products.

The House of Representatives standing committee on environment and conservation expressed concern about the fate of waste liquids that escape from disposal sites in the metropolitan region.

"Should this leachate find its way into ground water used as part of Perth's water supply the costs to community health and the finding of suitable alternative water supplies would be considerable," it said.

The committee's report, tabled in Parliament yesterday, said that about half of Perth's water supply was drawn from ground-water sources.

New dumping sites were being examined to replace those near ground water pumping areas.

The committee was concerned that some waste-disposal sites were near housing areas and that many households used bore water on their gardens.

Several companies were allowed to discharge waste directly into the sea in the Kwinana-Cockburn Sound area.

The report said that Perth had no single waste-disposal site. Several local authorities and some companies operated land waste sites.

There was little or no control over chemical waste transport.

Some public disposal sites were not permanently manned. Even when they were, the gatemen could not easily verify that the wastes were what the driver claimed they were.

Chemicals and septic-tank wastes could be--and presumably were--being mixed.

### Licensing

Though public and private sites for the disposal of liquid wastes had to be licensed under the Rights in Water and Irrigation Act, no facilities were available for wastes not included in the licence system.

It was believed that such wastes were disposed of by landfill methods "by one means or another."

Controls over chemicals disposed to landfill were inadequate.

The committee carried out an inspection of the Canning City Council's liquid-waste disposal site as well as landfill centres in Sydney, Melbourne, and Brisbane during its two year inquiry.

Referring to the Perth situation, the committee said that the common approach of liquid-disposal sites in the city was to tip the waste into pounds and allow the liquid element to evaporate and percolate through the permeable ground, which was usually sandy.

If the deposited solids interfered with the soaking-away of liquids, the ponds were allowed to dry out and the solids scraped away to make the ground permeable again.

#### Inadequate

"The Canning facility is far from adequate as a present-day liquid chemical waste-disposal facility, despite the commendable efforts of the Canning council to reduce the adverse effects of the facility," the report said.

"It is a major burden for an individual council to shoulder in the absence of guaranteed uniformity with other council areas and lacking the financial and technical resources to build and operate the kinds of facility needed."

The report said a WA Health Department report in 1979 had noted that existing disposal methods could not continue and had called for either a processing plant or waste exchange.

When the committee [as published]

The report said a WA Government was carrying out a survey to identify a hazardous chemical-disposal site.

The State had recently proposed a single secure landfill site for solid hazardous waste and had received the backing of the WA Local Government Association.

The committee did not know of any firm proposals by the Government for a liquid-waste facility.

CSO: 5000/7542

# OIL SPILLS THREATEN ECOSYSTEM IN BOTANY BAY AREA

Canberra THE AUSTRALIAN in English 22 Apr 82 p 11

[Article by Michele Ferguson]

[Text]

A HABITAT for rare migratory birds — such as curlews, sandpipers, dodwits and dotterels — in Sydney's Botany Bay is in danger because of pollution from oil spills in the bay, scientists at Sydney University have claimed.

The scientists, Dr Bill Allaway and Dr Tony Larkum are concerned at the damage to the ecosystem from oil spills which have resulted in a serious die-back of mangroves along the southern shores of Botany Bay.

Dr Allaway has been studying the mangroves in the bay for several years and his concern is shared by Dr Larkum who has worked on seagrasses in the area.

They have called for an improvement in clean-up operations should spills occur again.

The scientists believe skimmers and booms should be used more for oil clean up operations. Skimmers are devices towed by boats that skim over the water scooping up the floating oil which is

then transferred to trucks on shore.

## RESERVE

They said the endangered area was Towra Point on Kurnell Peninsula. Last month 281 hectares of the land was zoned by the NSW Department of Planning and Environment for preservation as "the most important nature reserve in NSW."

The area is listed by the United Nations as part of the World Heritage as it is the habitat for birds migrating from the northern hemisphere. The birds — such as the grey-tailed tattler — fly from as far away as Siberia and Japan each year.

Mangroves provide one of the few high-tide roosting areas on Botany Bay where migratory birds can shelter in safety.

Dr Allaway, a senior lecturer in Botany in the School of Biological Sciences said the declaration of Towra Point as a nature reserve "doesn't help much if the effects of past pollution and the likely pollution from future oil spills ultimately destroy the area."

VOTER WRITE-IN AGAINST RAINFOREST LOGGING ANALYZED

Sydney THE SYDNEY MORNING HERALD in English 20 Apr 82 p 9

[Article by Joseph Glascott: "Drummoyne Voters Oppose Logging of Rainforests"]

[Text]

Drummoyne electors on Saturday strongly opposed logging in NSW rainforests. The overall write-in vote against logging was 24.9 per cent.

This vote was verified by scrutineers for the Total Environment Centre, and supported by Mr Terry Metherell, the State Opposition spokesman on transport.

The Total Environment Centre asked electors to write "no rain forest logging" on their ballot papers at the by-election.

Mr Bren Claridge, of the NSW Rain Forest Action Group of the Total Environment Centre, said yesterday the write-in vote was a spectacular result.

He said the vote ranged from 32.8 per cent at Abbotsford booth to 30.6 per cent at Drummoyne, and 27.6 per cent at Queens Road, Five Dock, down to 11 per cent at a small booth at Five Dock.

He said the vote had been counted by official scrutineers with scrutineering rights given by the Independent candidate, Mr Nick Jones.

Mr Metherell said that at the main booth at Drummoyne Public School the write-in vote totalled 24.7 per cent of the overall vote.

The interesting thing was that Liberal voters recorded a total vote of 25.9 per cent against Labor's 20.7 per cent.

Mr Metherell said yesterday: "This write-in vote against rainforest logging was very substantial.

"After the 'no dam' vote at the Lowe Federal by-election, it shows that conservation issues are very much in the minds of electors.

"A higher write-in vote by Liberals than Labor voters in Drummoyne indicates that Liberal voters are becoming more sensitive on conservation issues.

"The high anti-rainforest logging vote will be a factor in deciding Opposition policy when the Premier, Mr Wran, brings down the Government's rainforest policy."

CSO: 5000/7541



GOVERNMENT ASKED TO ACT ON TOXIC WASTE DUMPING IN CREEKS

Brisbane THE COURIER-MAIL in English 20 Apr 82 p 11

[Text]

**HIGHLY-TOXIC liquid wastes could be dumped in Brisbane creeks unless the State Government moved quickly, the Brisbane City Council health chairman, Alderman O'Sullivan, said yesterday.**

He said the council-controlled Willawong liquid waste dump would soon reach saturation point and probably would close before 1983.

Alderman O'Sullivan said the council was urging the government to speed up a two-year study it started last year into liquid waste treatment.

"What we are concerned about is if there is no alternative to Willawong when it closes," he said.

"People complain about dumps like Willawong but that is nothing compared to what would happen if there was no dump. Highly toxic and dangerous liquid waste would be dumped in creeks, stormwater drains and sewers," he said.

Alderman O'Sullivan said the problem was

not just the councils. It affected every local authority in south-east Queensland.

"The whole treatment of liquid wastes in this area has to be co-ordinated," he said.

"To dump that sort of waste you need soil with a very high clay content. It would be now very hard to find such an area inside Brisbane well away from residential areas."

He said the council was having little success with government.

Someone should be working on an alternative site to Willawong," he said.

"It is quite horrific to think what might happen if there is no dumping area for toxic liquid wastes. Indiscriminate dumping of these wastes could create severe health and environmental problems."

CSO: 5000/7541

BRIEFS

BREAST MILK CONTAMINATION--Samples of breast milk are being taken from West Australian mothers to determine the extent of contamination from pesticides used against termites. Dr Peter Hartmann, senior lecturer in biochemistry at the University of Western Australia, said yesterday previous studies had shown "quite high" levels of contamination in human breast milk. Two chemicals were shown to have risen to levels of concern and recently a new compound, heptachlor, was found to be present in breast milk. Dr Hartmann said this compound had been introduced not long before to protect houses against termites. Initially, it was thought the contamination had come from pesticides used for agricultural purposes and strict legislation was introduced in Western Australia to control their use. Dr Hartmann said it was found in 1980 that levels of contamination in breast milk taken from mothers in agricultural areas was lower than those in city mothers. [Text] [Canberra THE AUSTRALIAN in English 23 Apr 82 p 2]

SOIL ABUSE PENALTIES--Greatly increased penalties are included in proposed legislation to strengthen the Soil Conservation Act. The Minister for Mines, Mr Jones, told the Legislative Assembly that the Soil Conservation Amendment Bill dealt with overall land degradation rather than the more narrow concept of soil erosion. It included wind and water erosion, salinity, flooding and the removal or deterioration of vegetation. The current legislation had been a response to the wind erosion associated with the crop-fallow system that operated in the wheatbelt in the 1930s and 1940s and therefore did not cover the other problems. Mr Jones said that penalties under the Act had been increased to bring them more into line with the seriousness of the problem. [In some cases the fines have been increased from \$20 to \$500 and from \$100 to \$1000.] He said that the proposed legislation would change the name of the Act to the Soil and Land Conservation Act. The Soil Conservation Advisory Committee would now consist of 10 people, half of whom would be representatives of rural land users, Mr Jones said. Mr Jones said that a major aim of the Bill was to place the responsibility for soil conservation firmly on the communities involved. [Text] [Perth THE WEST AUSTRALIAN in English 23 Apr 82 p 23]

SOIL CONSERVATION FUNDS--The acting Minister for Agriculture, Mr Day, has announced approval for an additional \$1 million in the current financial year to be lent to land holders for soil conservation. This brings the loan money total for approved soil conservation programs to \$4.15 million. The extra allocation was welcomed by the NSW Livestock and Grain Producers Association which had sought an additional \$1.7 million for soil conservation and water resource funding. [Text] [Sydney THE SYDNEY MORNING HERALD in English 29 Apr 82 p 3]

WATER MISUSE DAMAGE--The Millstream environment has been damaged by water-draws on the aquifer despite Government denials, according to North Province MLC, Mr Peter Dowding. He said that the Minister for Water Resources, Mr Mensaros, could put up as many figures as he liked, but an on-site inspection clearly revealed significant environmental damage. Mr Dowding said he was concerned that having caused a substantial deterioration of parts of the Millstream, the Government was now turning its attention to the Harding River. "Already the Harding River pools have dried up and if a dam is constructed, the river will be dry for most of the time," he said. "The recreational and conservation areas in the Pilbara are small but important and the demand for water has to be balanced with the need to preserve these areas." Mr Dowding said it was not only the right, but the duty, of citizens of the area to point out the detrimental effects on the environment. He had presented to Parliament petitions seeking an inquiry into the water resources of the region. They had contained more than 300 signatures. Such an inquiry might be necessary to fully protect the fragile resources of the North, he said. [Text] [Perth THE WEST AUSTRALIAN in English 29 Apr 82 News of the North p 19]

CSO: 5000/7543

## CHRISTCHURCH PLANS CAMPAIGN TO REDUCE AIR POLLUTION

Christchurch THE PRESS in English 30 Apr 82 p 4

[Text]

More clean air zones in Christchurch would mean pressure on coal merchants to improve their coal, the Canterbury United Council's air pollution committee heard yesterday.

The Christchurch branch manager of the State Coal Department and president of the Canterbury Coal Merchants' Association, Mr W. M. Warren, said that State coal met the 0.5 per cent sulphur content required in clean air zones but there were less suitable coals "going in the back door." State Coal supplied about 75 per cent of the local domestic market.

Many private coal merchants considered that 1 per cent was an acceptable sulphur content for coal used in space heaters and open fires, he said. Some who were heavily involved in private mines were not going to stop selling coal with higher sulphur contents that was their "bread and butter."

### **Campaign**

About \$19,000 will be spent on a two-month advertising campaign to reduce air pollution this winter.

Based on the slogan, "Make your home a clean air zone," the first newspaper advertisements will appear next week to promote the use of electricity and other smokeless methods of home heating. Approved electric and solid fuel heating appli-

ances will also appear in shops with "clean air" tags.

The Christchurch Meteorological Office will tag air pollution forecasts on to its answer-telephone service from tomorrow. Information on weather patterns will be updated in the mornings and afternoons to predict the level of pollution on a four-point scale from "low" to "severe."

### **Car exhausts**

Government action to reduce car exhaust emissions will be sought from the Minister of Transport (Mr Gair).

The committee will invite Mr Gair to discuss the matter. Dr N. J. Peet, a lecturer in chemical engineering at Canterbury University, said that pilot studies had already showed that regular exhaust testing led to fuel savings and less air pollution. A Government committee in 1977 had recommended including carbon monoxide tests in warrant of fitness tests but so far there had been only a publicity campaign on the fuel saving advantages.

Lead levels in petrol was another worry for committee members, who voted to ask the Ministry of Energy (Mr Birch) for a progress report on plans to reduce the lead content of petrol processed at the Marsden Point oil refinery.

BRIEFS

LEAD POISONING RESEARCH URGED--PA Wellington--A plea for more research into the problem of lead poisoning has been made by the New Zealand Clean Air Society. Blood lead levels previously thought quite safe may cause lowered intelligence in children, as well as behaviour problems, the society says. New Zealand, with 0.84 grams per litre, has one of the highest petrol lead levels in the world. The society says that although the Health Department favoured the removal of lead, it did not consider it a health hazard, and ignored overseas evidence indicating it was. It quotes the British Chief Medical Officer of Health as saying that there was a strong likelihood that lead in petrol was permanently reducing the I.Q. of many British children. The level of lead in petrol is expected to be reduced to 0.459/g in mid-1985, when extensions to the Whangarei refinery are completed, but the society says this is "too little, too late." By removing lead at its source, New Zealand may significantly reduce one of the most toxic and widespread pollutants from the environment, the society says. [Christchurch THE PRESS in English 4 May 82 p 4]

CSO: 5000/9070

FACTORIES POLLUTE ILOG BANADERO RIVER

Manila BULLETIN TODAY in English 17 May 82 p 17

[Article by E.T. Suarez]

[Text]

Residents of three barangays in San Pablo city complained yesterday that a river in their area is being polluted heavily by effluents released from the plants of two manufacturing firms.

In a letter to the National Pollution Control Commission (NPCC), barangay officials of Soledad, Sta. Maria and Stmo. Rosario said that Ilog Bañadero from where they used to get water for their daily needs is now so dirty and poses health hazards to residents.

The letter said the pollutants come from the San Pablo Manufacturing located at Schtelig avenue and from a soap factory in barrio Concepcion.

"The water in the river cannot even be used for washing clothes or for watering our plants," the residents said. "The water is so dirty it spreads

foul odor in the areas traversed by the river."

The residents expressed fears that their farms will also be affected because of grease and oil being poured into the river by the firms' plants.

The barangay officials said they brought up this problem three years ago to San Pablo Mayor Cesar P. Dizon who, in turn, notified the NPCC about it.

They said the NPCC conducted three hearings on their complaint but claimed that nothing has been done about it.

Among those who signed the petition were Hilario Atienza, barangay captain of Soledad; Servillano Arevalo, barangay captain of Sta. Maria; Elpidio Moreno, barangay captain of Stmo. Rosario; and Felimon Cuenca, president of Bañadero Integrated Services association.—  
E.T.Suarez

SRI LANKA

COMMITTEE ON WEST COAST EROSION ESTABLISHED

Colombo DAILY NEWS in English 12 May 82 p 1

[Text] Fisheries Minister Festus Perera yesterday appointed a five-member Committee to recommend ways to prevent the sea erosion that is damaging the Negombo Coast.

The committee was appointed at the request of Deputy Minister of Industries Denzil Fernando who said that Kuttiduwa village and the western head has been affected by sea erosion.

The Fisheries Minister however, ruled out Mr Fernando's request for the construction of a barrier at least at one point.

"That may worsen the situation. Barriers should be built after a careful consideration of the movement of the tides, ocean currents and other factors. We might have to construct a chain of barriers," he said.

The committee comprises Mr S.M.S. Jayasiri, Senior Asst. Secretary (Welfare), Fisheries Ministry Mr S.A. Amarasuriya, Chairman, Coast Conservation Board Dr W. Herat, Director NARA, Dr Milton Amaratunga of NARA and Mr Mervyn Jayasooriya, Chairman Ceylon Fisheries Harbours Corporation.

CSO: 5000/5754

## POLLUTION FROM INDUSTRIAL, AGRICULTURAL UNITS

Tirana ZERI I POPULLIT in Albanian 12 May 82 p 3

[Article by Faik Toska, inspector in the Ministry of Health: "Keeping the Natural Environment Pure"]

[Excerpts] In the framework of measures for the protection and strengthening of the health of the people, the protection of the environment occupies an important place. The 8th party congress set forth important duties for the most effective and highest quality organization of prophylactic work for the protection of the environment.

According to investigations and studies made by the directorates of hygiene and epidemiology in the districts, in collaboration with the Institute of Hygiene, it is evident that this matter is not regarded seriously everywhere. As a result, there have been cases of environmental pollution. For example, a problem which requires a speedy solution is the pollution of the atmosphere by sulphuric gas emanating from the copper smelting plants in Kukes, Mirdite and Lac. The concentrations of this gas which vary depending on meteorological factors have a bad effect not only on the health of the workers but also on the residents and the crops in nearby areas. Also, some plants which were built at an earlier date, such as the unit for the production of batteries, the asphalt-concrete factories and the thermoelectric power plant in the "Stalin" textile combine, the boilers in the industrial zone in Shkoder, the units of the rubber factory in Durres, etc. which emit dust and soot into the atmosphere are responsible for the deterioration of the air quality.

The problem of environmental pollution becomes more pressing with the intensification of agriculture and the increasing use of chemical powders and fertilizers. Therefore, they should be used on the basis of correct scientific criteria and with strict discipline in all aspects. The careful work which has been done in agricultural units in Lushnje District in regard to this problem should be generalized everywhere; in these units there is concern for the observance of all hygiene and health norms in all aspects, from the storage of products, which include pesticides and insecticides, in warehouses, to their transportation and use on a timely basis and with care.

A good measure for protecting the environment from pollution, in the villages, is the construction of stalls and other buildings used for the processing and



marketing of agricultural and livestock products in accordance with criteria set by the organs of the state health inspectorate. But there are still some agricultural units, such as those in Elbasan, Fier, Shkoder and Pogradec, which are not concerned about constructing these units with all the necessary annexes, despite the fact that all possibilities exist.

Some industrial enterprises of the food industry, such as the Lushnje enterprise, the factory for the production of sauce in the "Ali Kelmendi" combine in Tirana, the refrigeration plant in Vlore City, and others have shown lack of concern for the regulation of drainage systems and packaging and for the timely removal of production wastes.

The Institute of Hygiene, in cooperation with the directorates of hygiene in the main districts, has undertaken a number of studies which show that problems of protection of the environment are health problems as well as social, technical and economic problems. Therefore, their prompt solution requires complex and joint actions, with the participation of doctors, biologists, technical specialists, economists, etc. Also, the ministries concerned and the executive committees of the district peoples councils should coordinate better the work of studying and evaluating the situation and taking measures for the protection of the environment.

CSO: 5000/3015

## MEXICO

### BRIEFS

VOLCANO DEATHS TOTAL 98--Pichucalco, Chis., 26 April--Up to now army rescue squads have found 98 burned corpses in the vicinity of the Chichonal volcano, the area of most of the victims, said the town mayor, Manuel Carvallo Bastard. The mayor thought that it was "not possible for persons to have survived" in the town of Francisco Leon, which was buried under tons of gravel and sand emitted by the Chichonal volcano. Volcanic activity is now minimal. After having been sheltered in hostels in Villahermosa, Tah., the inhabitants of the area have returned to their communities and are continuing to rebuild their homes with the materials that the government has supplied them. Members of the army today again flew over the area affected by the volcano in search of more bodies. The governor, Juan Sabines, said that resettlement has now been started of hundreds of peasants affected by the eruptions. They received 1,154 hectares in the municipality of Tecpatan for the planting of seeds. [Text] [Mexico City EXCELSIOR in Spanish; article by Porfirio D. Lopez, EXCELSIOR correspondent; Apr 82 p 5-A] 8255

VSO: 5000/2119

AIR, WATER POLLUTION MEASURES

Manama GULF MIRROR in English 24 Apr 82 p 3

[Article by Philip Moore]

[Text] **BAHRAIN has become the beacon of a sweeping Gulf-wide pollution crackdown with the Prime Minister authorising the closure of offending factories and the island now designated the centre of plans to combat the problem.**

Prime Minister, HE Shaikh Khalifa bin Sulman Al Khalifa, recently inspected a village and after complaints by residents, gave leave to the Central Municipal Council to close factories that were not taking anti-pollution measures.

"They have until the end of the month to comply and if they don't, they will be shut down," says Municipality Chairman, Shaikh Abdulla bin Mohammed Al Khalifa.

**Official**

"The Prime Minister told me to 'do what I had to do' after he saw evidence of pollution and talked to the villagers," said Shaikh Abdulla.

There is no anti-pollution legislation on environmental grounds in Bahrain (despite

a mid-week press report to the contrary) and several months ago Shaikh Abdulla had to ask the Ministry of Health for help but now he

has received the official seal from the Prime Minister.

The Municipality action looms as one of the toughest initiatives as Gulf countries launch a scheme to fight pollution, especially at sea, where a U.N. research team describes the situation as "catastrophic".

Bahrain will be the base for the joint Gulf action and the operation will be administered by the island's Health Ministry.

A meeting of the Regional Organisation for the Protection of Marine Environment, comprising representatives from around the Gulf and held under the auspices of the U.N. Environment Programme, has just finished a top-level meeting in Kuwait.

Plans were finalised for two major research projects — into oil pollution in the Gulf and into oceanography plus the setting up of the centre in Bahrain to combat oil pollution and run a massive anti-pollution campaign throughout the region.

Gulf waterways are vulnerable to pollution and although Qatar and Kuwait

are installing sewerage systems, Bahrain was dumping more than half its untreated sewage into the sea.

"We have put a stop to that — we stopped it a couple of months ago," says Shaikh Abdulla, adding that the main task now facing the municipality is making sure air pollution does not get away.

And in the UAE, it was announced this week that a special environment committee has been formed.

Announcing the anti-pollution drive, UAE Federal Council member, Rashid Saif, called on industrial nations to help developing countries protect their environments and urged "all concerned to accelerate and guide development efforts."

Mr Saif confirmed that the UAE had now joined seven other Gulf countries in a marine environment protection drive.

CSO: 5000/4710

## BRIEFS

POSSIBILITY OF RATIONING WATER--Manama--The newly formed Water Resources Council discussed the possibility of water rationing, the Gulf News Agency reports. During its meeting yesterday Commerce and Agriculture Minister Mr Habib Qassim said that a working paper from his ministry on water conservation included the possibility of installing meters on all artesian wells, preparing a programme for maintaining and developing springs and a general policy for digging new wells. It also contained proposals for rationing consumption for farming and household use and industrial consumption. Justice Minister Shaikh Abdulla bin Khalid Al Khalifa will head a committee to study conservation proposals and report back to the council. Bahrain's Prime Minister, Shaikh Khalifa bin Salman Al Khalifa, presided over the Water Resources Council's first meeting yesterday. The Council's session began with a directive from the Prime Minister on the aims the Council and its responsibilities--mainly drawing up the country's water policy and means of conserving water. [Text] [Dubayy KHALEEJ TIMES in English 20 May 82 p 1]

CSO: 5000/4711

## PALESTINIAN STUDY OFFERS VARIOUS STATISTICS ON WEST BANK WATER USE

Beirut SHU'UN FALASTINIYAH in Arabic No 126 May 82 pp 36-37

/Article: "Water Policy in the Occupied West Bank"/

/Text/ Introduction

Water is considered an economic resource of the utmost importance as far as most countries go--especially the countries of the Middle East and North Africa. Although the countries in this region enjoy a relative abundance of land and manpower, the element limiting their increased agricultural output is a shortage of irrigation water, or the misuse of it if it is available. However, the importance of water, as far as the Palestinian people go, transcends purely economic considerations, since it is directly linked to the struggle the Palestinian people are waging in order to support their survival on their territory, in the face of unremitting efforts to deprive them of all these resources for survival, especially land and water.

The circumstances of water in the West Bank involve many technical, economic and political angles and this study cannot cover the subject from all of them. However, it is nonetheless aimed specifically at casting light on the water resources available on the West Bank in terms of type, distribution and volume of production. After we have done this we will proceed to analyze various aspects of water consumption and compare that with consumption in Israel. We will also try to review, in summary fashion, water conditions in Israel in order to arrive at an understanding of the motives and background governing Israeli water policy toward the occupied territories, in particular the West Bank. Finally, we will try to provide some guidelines for domestic water policy under current conditions and restrictions. When conditions change and the Palestinian people gain actual control over their territory, it will be possible to review this entire issue on new bases.

### Rain

Rainwater is considered the sole origin of all viable water sources on the Bank, namely artesian wells, springs and collection wells. The West Bank of Palestine has no snowy areas, rivers or fresh lakes; therefore, all water studies must address themselves at the outset to an analysis of rainfall pattern, in terms of quantity and distribution.

Volume of Rain: The West Bank for the most part consists of a range of hills and mountains extending from north to south and paralleling the Mediterranean. Therefore the western slopes of these mountains receive relatively plentiful amounts of rain, ranging from 300 to 650 millimeters. It is to be noted, in general, that the amount of rain drops off sharply on the eastern slopes of the Palestinian mountain range, because these lie on the leeward side. This applies in particular to the mountains paralleling the Jordan Valley area, where no more than 200 millimeters fall a year on the average. The volume of rain also declines as one goes south, amounting to less than 100 millimeters in the Jericho area and 100 to 200 millimeters in the southeastern area of the Governorate of Hebron.

One can get a more detailed idea of the geographical breakdown of West Bank rainfall by studying a map showing rainfall distribution isobars based on average rainfall over 30 years (1931-1960). From such a map, and from readily accessible tables on rainfall in various locations, it is apparent that one can break down the surface area of the Bank in terms of the rain that falls in it as follows:

Less than 250 millimeters:	22 percent
From 250 to 300 millimeters:	10 percent
From 300 to 400 millimeters:	15 percent
From 400 to 500 millimeters:	10 percent
From 500 to 600 millimeters:	22 percent
More than 600 millimeters:	21 percent

Although these rates do not place the West Bank in the category of humid areas, they are to be considered quite high when compared with most countries in the Near East, including Jordan. Table One shows that 79 percent of the land in the Near Eastern countries receive less than 100 millimeters, as compared with 12 percent on the Bank. In comparison with the east bank of the Jordan, in particular, we observe that just 8.6 of the land area in Jordan gets more than 200 millimeters as compared with 80 percent in the West Bank.

Table One: Classification of Ground Area in the Near East by Rainfall Rates (in Square Kilometers)

Country	Surface Area	Less Than 100 Millimeters	Percent of Total	100 to 400 Millimeters	Percent of Total
Iraq	435,000	96,000	22	291,000	67
Jordan	98,000	50,000	51	46,000	47
Syria	185,000	--	--	167,000	90
Lebanon	10,000	--	--	1,000	10
Near East	3,705,000	3,033,000	79	589,000	16
West Bank	5,520	552	10	2,042	37

Abdullah Arar, "The Role of Rainfed Agriculture in the Near East Region," a Paper Submitted to the FAO Regional Seminar on Rainfed Agriculture. Amman, 5-10 May 1979.

The rainfall in the countries along the Mediterranean is characterized by extreme discrepancies between seasons. Therefore arriving at estimates of the volumes of rain that will fall during a normal season is not easy, and such estimates are exposed to a large degree of seasonal deviation. One organization has estimated the volume of rain that fell in the Bank in 1964 and 1965 in the light of these seasonal discrepancies (see Table Two). This organization estimated the volume of rain during two consecutive seasons at 2.8 billion cubic meters.

Table Two reveals an important fact: the volume of water that can be used (under optimum conditions) is about 800 million cubic meters. The strategic importance of this fact becomes apparent when we realize that total consumption by Arab citizens in the West Bank does not exceed 120 million cubic meters a year at the present time.

**Rainfall pattern:** The rainfall pattern on the West Bank (as in other countries on the eastern Mediterranean) is distinguished by specific characteristics that are clearly reflected in the sectors of agriculture and the domestic economy in general. Among the most important of these characteristics are the following:

1. Rainfall is restricted to the winter season, in particular the period between 20 December and 20 January, when about 70 percent of the annual volume of rain falls. Toward the end of March the rainfall finally stops (except for a few showers in April). The dry season lasts until November, although there are violent showers in October whose losses are generally greater than their benefits. In light of this situation, physiological studies on arid regions of Middle East countries have shown that the volume of water that plants lose through evaporation and transpiration (the evapo-transpiration rate) is greater than the volume of water the soil receives from rain for as much as 9 months a year. This proves the extent of the importance of retaining soil humidity and storing it until it is needed for three quarters of the year.
2. The rainfall rate varies extremely between seasons and between months in a single season. Graph one shows the annual volume that fell on the city of Jerusalem from 1850 to 1970. The extreme discrepancy in the volume of rain between years is apparent from this graph. One can consider this state of affairs a paradigm for the remaining areas of the West Bank. Graph Two also shows the extreme weekly differences in the volume of rain that fell in the town of Tulkaram in 1978.

Table Two: Volume of Rain Which Fell in the West Bank and the Courses It Followed (Average for 1964 and 1965)

Volume of rain which fell	2.8 billion cubic meters
Evaporation	1.9 billion
Balance, which is converted to:	0.9 billion
Groundwater	0.724 billion
Water in rivers and streams	0.114 billion
Surface runoff	0.062 billion

"West Bank Hydrology," London, Rolfe and Raffety /sic/ Consulting Engineers, 1965, p 15

Graph One: Annual Fluctuations in the Volume of Rain in the City of Jerusalem  
/Graph in English/

Graph Two: Volume of Rain Per Week Recorded in Tulkaram (1978)  
/Right column/ Millimeters /by tens/  
/Bottom, from right to left/ January February March April May June July August  
September October November December  
/Left column/ Millimeters /by tens/  
Source: Official records.

The two phenomena of the seasonal discrepancies in the volume of rain and the extreme fluctuations within seasons have had a profound effect on agricultural output and rural life in the West Bank. Most years farmers are surprised by the volume and distribution of rain, which can cause them the most grievous damage, for instance when the season starts well and is encouraging enough to persuade farmers to plant their fields with crops (wheat and barley), then may be followed by an absence of rain for many weeks, leading to the drying out of crops and a severe decline in olive and fruit tree crops that depend totally on the rain for irrigation.

3. The rainfall pattern is also marked by intense violence on most occasions when violent, intense storms occur in the course of a few hours. It is clear that this pattern of rainfall inflicts severe damage, not the least of which is the occurrence of extreme topsoil erosion, especially in areas with slopes, which snake up the overwhelming majority of the area of the West Bank. In reality, soil erosion in some areas has reached the point where it constitutes a national economic disaster. The use of tractors for plowing land with slopes along the slopes has helped aggravate the problem.

In another area, we also note that the bulk of the rainwater that falls during rainstorms percolates into watercourses and goes to waste rather than being stored in the ground or behind earthen dams erected for this purpose.

### Springs

There are about 300 springs in the West Bank; however, most of these are seasonal, have low discharges and are of no agricultural value. Even the major springs are characterized by extreme discrepancies in output according to fluctuations in rainfall. In addition their conditions are very bad in general because of abuse and a lack of official interest in developing them and raising their productive capacity.

The best accessible source at present on existing wells in the occupied territories is the hydrological yearbook which the Water Department of the Israeli Ministry of Agriculture issues titled "Hydrological Yearbook of Israel." This report contains a special separate descriptive table for each well showing the volume of its monthly and annual discharge, its rate of concentration of salts and chlorine ions and some other important information. The latest report issued in this series (for 1976-77) contains information on 56 wells in the Bank whose individual discharges exceed 30,000 cubic meters a year. The accompanying well guide shows a table on all these wells, the volume of discharge of each and its chlorine concentration.



The springs are irregularly distributed throughout the Bank. It is apparent from a geographical study of the locations of these springs that most of them lie in the center of the country, on the western slopes of the Palestinian mountains. However, the springs situated on the eastern slopes have a much higher productive capacity; in 1976-77 they produced about 93 percent of the total annual discharges of the springs in the Bank (see Table Three).

#### Artesian Wells

In the Bank there are at present two clusters of artesian wells, one for Arab citizens and the other for Jewish settlers. We will deal with each of these two clusters separately.

Table Three: Number of Springs and Their Total Annual Discharge

	Number of Springs	Total Annual Discharge (in Thousands of Cubic Meters)	Percent
Eastern slopes	24	49,753	93.3
Western slopes	32	3,572	6.7
/Total/	56	53,325	100

Arab wells: In spite of the pressing need for water for agricultural purposes and household purposes both, the production of groundwater from artesian wells began on a broad scale only in the mid-sixties. Until then, new wells were characterized by technological backwardness in terms of the ability of drilling equipment to reach great depths and the type of pump used to pump up the water. The number of wells drilled up to the eve of the Israeli occupation totalled 720, of which 314 are currently pumping while the rest are dry, neglected or shut down for some reason.

One can ascertain the volume of water the Arab wells in the West Bank pump in detail by the readings the Central Water Department takes off the meters on those wells. This department issues a detailed annual report on all of these wells, showing the volume of water pumped up from each one every month. Table Four contains a summary of this report, showing the number of wells operating in each region and the volume of water produced by them in 1977-78.

From this table, it is apparent that the overwhelming majority of the wells are distributed between two areas. First is the plateau strip parallel to the western slopes, lying in the Janin-Tulkaram-Qalqiliyah area. The second main area is al-Aghwar where there are 96 wells that pumped up 26.2 percent of the total. In the mountainous areas of the southern districts, there are only 10 wells, three of which are not pumping; 13.3 percent of the total output was produced from these. Therefore there is a pressing need to drill more wells in these areas especially, in order to solve the problem of the shortage of drinking water (for people and animals) which these areas face from time to time.

Table Four: Number of Arab Artesian Wells, Their Distribution by Region and the Volumes of Water Produced from Them (1977-78)

Region	Number of Operating Wells	Volume of Water Produced (Thousands of Cubic Meters)	Percent of Total
A. Al-Aghwar		9,932.7	26.2
Jericho	40	3,464.5	9.1
Al-'Awja,			
Fasayil	11	1,077.8	2.8
Al-Jiftlik	29	2,656.1	7.0
Marj Na'jah	8	879.5	2.4
Bardalah	8	1,854.8	4.9
B. Wadi al-Fari'ah	23	2,767.3	7.3
C. Western Slopes		20,204.8	53.2
Janin, 'Arabah,	56	3,277.8	8.6
Qibatiyah			
Tulkaram	59	10,128.8	26.7
Qalqiliyah	70	6,798.2	17.9
D. Southern mountain areas		5,033.6	13.3
Ramallah	2	891.6	2.4
Bethlehem	2	3,653.0	9.6
Hebron	6	489.0	1.3
Total	314	37,938.4	100.0

Annual report on monthly well production, 1977-78, Department of Water, West Bank Command, 1979.

Israeli wells: Proceeding from the colonialist policy it pursued from the first months of the occupation, the Israeli government inspired the Makorot Company to start drilling the necessary artesian wells to serve the settlements on which construction work had begun. At the beginning the drilling was confined to the al-Aghwar region, in keeping with the Alon belt settlement plan. In some cases the authorities resorted to taking over some Arab wells owned by absentees (as was the case near the Damiyah Bridge) and exploited them on behalf of the settlements.

There is a controversy over estimates of the number of Israeli wells drilled since the occupation. The latest Central Water Department annual report (for 1977-78) contains just a list of the 17 wells the Makorot Company owns; these all lie in the al-Aghwar area. According to the data in this report, the volume of water produced from these wells came to about 14 million cubic meters that year. Table Five shows a list of these wells and their production volume of as stated in this report.

Table Five: Israeli Wells in the Jordan Valley

Number	Name of Well	Volume of Water Produced (Thousands of Cubic Meters)	Coordinates
1	Jitit One	271.3	186.09/189.40
2	Marj Na'Jah 14	246.7	174.59/198.68
3	Marj Na'jah 29	310.0	174.51/199.64
4	Fari'ah 5	1.1	170.40/186.66
5	Aryeh 1	162.6	171.65/195.90
6	Miswah 1	1,179.8	176.03/193.05
7	Fasayil 2	1,146.4	162.15/189.34
8	Fasayil 3	1,154.9	161.91/188.61
9	Fasayil 4	852.4	165.20/189.70
10	Jericho 1	1,226.8	140.80/190.90
11	Al-'Awja 1	277.3	151.20/187.30
12	Al-'Awja 2	830.7	151.25/187.45
13	'Attarah 1	1,705.5	177.50/192.80
14	Baqi'ah 1	734.5	181.04/196.51
15	Bardalah 1	3,901.0	199.20/194.49
16	Bardalah 2	26.2	unknown
17	Jitit 3	117.6	unknown
<u>/Total/</u>		14,144.8	

Annual report on monthly well production, Department of Water, West Bank Command, 1979, pp 11, 12.

Official estimates of the water produced from the Arab and Israeli wells (Tables Four and Five) reveal an important fact regarding the significance of Israel's water policy in the occupied areas. It is apparent to us that the 17 Israeli wells pumped up about 37 percent as much as all the Arab wells combined, which total 314.

However, the actual number of Israeli wells in the Bank is greater than that stated in this report. In recent years, two new wells were drilled in the al-Aghwar, one in the al-'Awja area and the other in Bardalah. There are also a number of Israeli wells in the mountain areas. Although there are no official statistics on the number or output of these, the information available indicates that there are three wells in the area of Arab Jerusalem, two in al-Latrun, and one each in Kafr Qaddum, Kafr Malik and Kafr Sur. Thus it is believed that the total number of Israeli wells in the Bank is 27. On this basis, the volume of water Israel is pumping up from its wells on the Bank greatly exceeds that mentioned in Table Five; it is perhaps equal to one half the total amount that the Arab wells are pumping.

Lastly, one must refer to a number of wells which the Central Water Department of the Office of Agriculture in the military government owns and operates. This department owns seven wells which have the purpose of supplying nearby Arab villages with drinking water. These wells are situated close to Qabatiyah, Bayt Iba, 'Arabah, al-Fari'ah (all of which have been drilled recently), Bethlehem, al-Zawiyah and Shabtayn.

This department, and all the Arabs working in it, performed many services for the Arab villages adjoining its wells, but one problem that raises complications is that the military government considers itself the owner and heir of these wells and therefore there are strong doubts about its real policy in this regard. One can consider the plans the authorities are making for the Bayt Iba well and others to be an example of what they intend to do ultimately, which is to shift part if not most of the output of these wells to the Israeli settlements adjacent to them.

#### Problems of Artesian Wells

The Arab artesian wells on the Bank faced numerous problems that stand in the way of increasing their production, or even reduce it. Here is a summary of the most important of these problems:

1. Prorating the quantities produced.

The authorities, in the mid-seventies, issued permits to well owners showing the volume of water they were permitted to pump each year and warning them that if they took more than the volumes they were allowed that would make them liable to prosecution in military courts. The official bodies justified these measures on the pretext of preserving groundwater resources, regulating their exploitation and so forth.

As a result of the method by which the process of estimating the quantities one was allowed to pump up and the circumstances in which the prorationing policy was applied, grave losses were inflicted on many farmers. The estimate was made on the basis of the actual pumping rate of each well in the years 1975 and 1976, although the farmers were not informed of the real purpose behind the reading of the meters that were installed on their wells, and the circumstances surrounding each well in isolation were not taken into consideration. This produced extreme discrepancies. With wells that were not operating at full capacity during the measuring period for some reason, such as agricultural cycle requirements or the fact that the orchards were recently planted and did not need large quantities of water in their first years of life, the owners of the wells themselves found themselves in an embarrassing situation later, when their need reached its normal level. The owners of the wells that were pumping for the sake of selling water during the measuring period obtained permits for quantities that were greater than their actual production requirements.

However, the most significant damage the prorationing process caused could be attributed first of all to the farmers' inability to modernize the irrigation methods they followed at the speed they were forced to. Modern irrigation methods, as we will see later, require a very advanced level of technological understanding and immense amounts of capital that are not available to them from any sources of agricultural financing.

For all these reasons, many persons farming by irrigation were not able to increase production or were compelled to reduce it because of a relative or at times real deficit in the volume of water available to them. However, the problem was much less stringent in the case of farmers who were able to develop irrigation methods in their farms and orchards.

## 2. The decline in productive capacity.

Perhaps the most significant problem all Arab wells face is the decline in productive capacity which is caused by the accumulation of a number of factors leading to this result. The pumps and motors used on those wells are of old types whose capabilities have gradually weakened with the passage of time. In view of their excessive fuel consumption, the cost of operating them has greatly risen, and this has had a tangible effect on the costs of agricultural production. In another area, these wells have reached a very bad state because of the accumulation of silt in the bottoms of their holes and the fact that they have not been worked over since they were drilled. The third reason for the decline in production may be ascribed to the type and depth of the aquifer from which the Arab wells produce. These wells produce from a relatively shallow aquifer known as the Pleistocene, whose depth in general does not exceed 100 meters. The problem here is that wells that produce from a zone like this are likely to be affected rapidly when the groundwater level drops in emergencies, such as a lack of rain for a long period.

The Israeli wells go down to a zone known as the Cenomanian, which can be more than 400 meters deep. Since aquifers at various depths are interconnected by faults, which are characteristic of the geological composition of the area, the burden of drought reaches those only after the Arab wells (which are closer to the surface) have resisted it to the last drop.

The dangers surrounding the Arab wells on the Bank are not far-fetched theoretical possibilities--to the contrary, the problem has started to assume a very real form. In the summer of 1979, most of the wells in the Tulkaram area faced a severe deficit in output which led to a total suspension of pumping in some cases. Naturally a lack of rain helped increase the severity of the problem, but the most important cause was the effect of Israeli artesian wells on adjacent Arab wells. This statement applies in particular to the wells situated in the western plateaus of the Bank, which are competing with a very large number of Israeli wells located west of the Green Line.

### Gathering Wells

Wells for gathering water have occupied a prominent place in the economic and social history of the Palestinian people since the oldest times. There is no village that does not have a number of wells, some of which date back a number of centuries. The main purpose of these wells is to store water in the winter season for use for drinking and watering animals during the long summer months. Unfortunately there are no statistics on the number of these wells, but their number is estimated at from 6,000 to 10,000.

It is clear that the importance of the gathering wells has greatly declined in recent years because of the great expansion in water distribution systems, which draw their water from artesian wells or major springs. This has resulted in the neglect of a large number of wells and damage to some of them. However, there still is a large number of villages that depend on gathering wells in general to meet their drinking water requirements. Therefore we find that the wells in these villages receive an adequate amount of attention and maintenance.

Neglect of gathering wells in the Palestinian countryside is a waste of one factor of production that will probably play an important role in the process of modernizing the means of production in unirrigated agricultural areas. The presence of this sort of well in unirrigated fields and orchards would help solve one of the main problems facing the application of various insecticides and pesticides, since it is not a simple matter to pipe water to fields. Moreover, the presence of water in olive and fruit tree orchards would enable farmers to save a little irrigation water for the seedlings that are planted toward the end of winter and might be in the most intense need of irrigation during the first summer after their planting.

It is worth mentioning that there are some types of modern spraying machines that can be used not just for irrigation purposes but also for pumping water from shallow wells. Perhaps machines of this type can play a big part in developing unirrigated agriculture on the West Bank, in which case gathering wells will play a vital role again.

#### Estimating Water Consumption

Water is principally used for household consumption purposes and for agricultural and industrial production activities. However, its main consumer is agriculture.

There is an extreme discrepancy in experts' estimates of the volume of water consumption on the Bank. The main difference is in their estimates of the volumes consumed in the agricultural sector. Perhaps one reason for the difference in estimates is the massive discrepancy in the productive capacity of springs and artesian wells between seasons, which are subject to changes in rainfall. As a weighted average of various estimates, we can say that the total volume of water consumption on the West Bank is within the limits of 100 million cubic meters, as compared with 1.72 billion cubic meters in Israel (1975). This means that the overall rate of per capita consumption in the Bank is 142 cubic meters as compared with 537 cubic meters in Israel. The discrepancy is reflected in particular in the rate of per capita household consumption, which comes to 13 cubic meters in the Bank as compared with 86 cubic meters in Israel. One should bear in mind that household consumption on the Bank also includes industrial sector consumption while industrial consumption in Israel comes to more than 95 million cubic meters, or roughly the total consumption of water on the Bank (see Table Six).

Table Six: Average Estimates of Water Consumption on the West Bank and in Israel (Millions of Cubic meters)

	West Bank	Israel
Agriculture	90	1,327
Industry (in the case of the West Bank, estimated along with household consumption)	--	96
Household consumption	10	367
Total	100	1,780
Overall per capita consumption rate	142	537
Per capita household consumption rate	13	86

Statistical Abstract of Israel, 1980, Jerusalem, Central Bureau of Statistics, No 316, Page 430.

Some towns and villages suffer from difficult problems in terms of the need for water used for household consumption purposes. In view of the distinctive nature of this type of water consumption, it is recommended that an expert be assigned to deal independently with it. However, in the following section we will address ourselves to the use of water for irrigation purposes.

### Irrigated Farming

The agricultural sector assumes particular importance in the Palestinian national economy. Farming is one of the major economic sectors in terms of its contribution to gross national product, since its share of gross domestic product is estimated at 28 to 32 percent and its share of manpower comes to about 30 percent. However, in addition to that, agriculture is considered one of the most important pillars linking the Palestinian people to their land, purely economic considerations to the side. Therefore the development of this sector must head the list of priorities in all domestic plans to bolster the Palestinian economy.

The total area of the West Bank comes to 5,572,000 donums. However, the portion of that that is cultivated is estimated at just 2,008,700 donums, or 28.9 percent of the total. (1) The irrigated area is estimated at about 77,000 donums, or 4 percent of the total cultivated area. Table Seven shows the distribution of irrigated land by district and type.

Table Seven: Irrigated Land by District and Type, 1978 (in Donums)

District	Vegetables	Citrus	Bananas	Other Trees	Total
Janin	6,547	2,516	--	12	9,075
Tulkaram	14,550	17,005	--	621	32,176
Nabulus*	787	1,563	--	--	2,350
Ramallah	463	206	--	--	669
Jerusalem	--	--	--	--	--
Jericho	24,350	4,576	2,128	150	31,104
Bethlehem	1,011	--	--	--	1,011
Hebron	700	80	--	--	780
Total	48,308	25,945	2,128	783	77,165

#### Official Agriculture Department Statistics

\*It should be noted that all the al-Aghwar, which belonged to the District of Nabulus before the occupation, were incorporated into the Jericho Agriculture Department after the occupation. That explains the decline in irrigated land in Nabulus District.

The irrigated acreage shown in Table Seven indicates that the total irrigated land remains relatively fixed in spite of the measures the authorities have taken in the al-Aghwar, which have greatly reduced the cultivated area there. However, farmers in the plain areas have added to the irrigated area through their use of more modern irrigation methods, making up for the shortage which occurred in the al-Aghwar.

A sad fact as far as the West Bank goes is that the percentage of irrigated land there is much less than that in the countries of the Near East, although the Bank

receives more rain than they do, as we have seen previously (see Table Eight). Naturally this situation was an anticipated result of the declared Israeli policy of controlling water resources in the occupied territories.

The real importance of the irrigated farming sector on the West Bank is much greater than these figures would indicate. For example, citrus and irrigated vegetables' share of gross agricultural income ranges from 22 to 30 percent. If we add bananas, nurseries and some other irrigated crops, irrigated agriculture's share may be greater than one third the agricultural income most years.

It is also well known that irrigated farming is the field that responds the most to rapid development through modernization and intensification of means of production. However, we have previously seen the severity of the restrictions imposed on expanded use of water resources. Thus one of the basic goals of national water policy in the current stage is to realize the best possible use of currently accessible water resources. In other words, the most important goal to this end is to exert all possible efforts to expand the irrigated cultivated area by seeking to use modern irrigation methods which will be more capable of bringing water to the root area where the actual need for it lies.

#### Modern Irrigation Methods

Over the past 5 years, tangible development has been achieved in improving the irrigation methods farmers use in the West Bank, thanks to the efforts agricultural advisors and some private organizations have exerted. We will review the achievements which have been made and the obstacles impeding expansion in this field.

Table Eight: Breakdown of Cultivated Land by Irrigated and Non-Irrigated Areas (in Thousands of Donums)

	Total Cultivated Area	Unirrigated Area	Irrigated Area	Proportion of Irrigated Land, Percent
Iraq	59,200	30,000	29,200	49.3
Jordan	5,290	4,900	390	7.4
Syria	54,700	49,600	5,100	9.3
Lebanon	2,760	1,960	800	29.0
West Bank	2,020	1,943	77	3.8

Abdallah Arar, "The Role of Rainfed Agriculture in the Near East Region," a Paper Submitted to the FAO Regional Seminar on Rainfed Agriculture, Amman, 5-10 May 1979.



Water catchment ponds: One of the most important development steps in irrigation methods is that of constructing ponds to store the water produced by artesian wells or springs so that it can be used when needed. There are many very important benefits to this process. In addition to enabling farmers to irrigate their cultivated areas at the appropriate times, it also guarantees that water will be transmitted to irrigation pipes under sufficient pressure so that modern water transmission and distribution methods can be used.

Official 1978 statistics show that there are 83 irrigation ponds in the West Bank with a total capacity of about 262,000 cubic meters. Table Nine shows the distribution of these ponds by district. It appears that they are currently concentrated in the al-Aghwar areas, but Agriculture Department experts recommend the construction of more in the area of al-Qalqiliyah, Tulkaram and Janin. However, the main obstacle in the way of that is the lack of domestic financing sources at the present time.

Table Nine: Number and Capacity of Irrigation Ponds and Their Distribution by District (1978)

District	Number of Ponds	Total Capacity (in Cubic Meters)
Jericho	81	260,000
Tulkaram	1	1,100
Bethlehem	1	500
Total	83	261,600

Official statistics.

Sprinklers and drip pipes: Perhaps one of the most important technological innovations Arab farmers in the Bank acquired in the seventies is their emulation of the drip irrigation system or what is known as "tiftaf," and the system of irrigation by sprinklers. These methods save a great percentage of the water that goes to waste in open earthen canals and through traditional irrigation methods. In addition to that, they make it easy for farmers to use fertilizers and pesticides by dissolving them in the reservoirs and piping them through the irrigation water. It is no secret, either, that these systems require less manual labor, and at the same time, if properly used, guarantee the equitable transmission of water to all the plants. It has been discovered through experience that this will result in an increase in production and greater homogeneity of growth among plants.

Sprinkler and drip irrigation methods have become substantially widespread throughout most irrigated farming areas in the Bank. In 1979, the area of land irrigated by the drip irrigation system came to 13,120 donums and that by sprinklers to 8,070 donums. In addition, there are 850 donums irrigated by what is known as "sharful," which is a simplified drip irrigation technique (see Table 10).

In spite of the relative expansion in the area of land irrigated by modern methods, that still does not amount to more than 17 percent of the total irrigated area. This gives a clear idea of the scope of effort that must be exerted in this field.

Perhaps the greatest obstacle preventing major expansion in this direction is not the farmers' conviction in the feasibility of these methods, since they are totally convinced of it, but the enormous costs these methods require. Estimates by Agriculture Department experts show that expansion costs per donum (in 1978) were 63 Jordanian dinars for sprinklers and 121 dinars for drip pipes. (2)

Table 10: Areas Irrigated by Modern Methods, 1979 (in Donums)

District	Sprinklers	Drip Pipes	(Sharful)
Jericho	908	9,237	850
Nabulus	90	303	--
Janin	1,300	1,000	--
Tulkaram	5,767	2,490	--
Ramallah	5	45	--
Jerusalem	--	--	--
Bethlehem	--	--	--
Hebron	--	45	--
Total	8,070	13,120	850

Official statistics.

However, the advantages the farmers obtain as a result of using these systems, especially drip pipes, justify the massive financial investments in them. A modern economic study carried out by the Jordanian Faculty of Agriculture on the north al-Aghwar areas of Jordan has demonstrated that the per-donum output of tomatoes by drip irrigation is triple that of irrigation by traditional methods and that productivity from the use of plastic houses with drip irrigation was double that of drip irrigation without plastic houses. These conclusions are reflected in the "profitability" of the three systems, as is apparent from the present value of the income per donum over 10 years (see Table 11).

Table 11: An Economic Comparison of Tomato Production Under Various Technological Conditions in the Eastern al-Aghwar of Jordan

	Traditional Irrigation and Farming	Drip Irri- gation	Plastic Houses with Drip Irrigation
Average investment cost (in dinars)	--	280	1,998
Per-donum output (in tons)	1.52	4.5	10
Present value of average per-donum income over 10 years (in dinars)	33.3	115.4	222.7

Akram Satitiyah and Muhammad 'Abbas, "Preliminary Report on the Economic Feasibility of Methods of Producing Tomatoes and Cucumbers," Amman, Faculty of Agriculture, Jordanian University, 1978, page 6.

Although there are no accurate studies on the relative difference in profitability of modern means of irrigation and farming in the West Bank, they do not differ greatly from those in Jordan.

There is a final observation on this subject. It has been noted that the use of modern irrigation methods on the bank is almost entirely restricted to irrigated vegetables and nurseries. These methods have not yet been used in the irrigation of citrus and banana orchards, which are the main consumers of water, and there is no doubt that this situation constitutes a major obstacle to doubling the efficiency of the volumes of water available to farmers on the Bank. Although the issue requires concentrated study, one can assume that the main cause of the farmers' hesitancy is not just confined to the paucity of financing but that it reflects some doubt among most farmers on the suitability of the drip irrigation method with trees.

#### A Summary of Water Conditions in Israel

Talk about water resource conditions on the West Bank is closely linked to water policy in Israel. Here we will try to underline the main features and problems of water conditions in Israel, in order to arrive at an understanding of the motives and dimensions of Israeli policy toward water resources in the occupied areas of Palestine.

Control of land and water is to be considered the main buttress of the Zionist scheme which was aimed at establishing the Jewish state in Palestine. The Jewish Agency and the first Jewish leaders worked to attain Jewish control over water resources in Palestine, including the sources of the Jordan River. In a secret document Ben Gurion wrote in 1941, which the British Foreign Ministry subsequently published, the following appeared: "We must point out that in order for the Jewish state to be able to survive the Jordan and al-Litani waters must be incorporated within our boundaries." (3) In fact, the Jews did carry out most of their water schemes when Israel was established in 1948, since the new state took over most of the water resources in Palestine.

From its establishment, Israel began to carry out a number of ambitious water projects that were aimed at achieving the greatest degree of exploitation of the water resources it had taken over; American financial and technical support enabled it to carry out most of these projects.

Perhaps the greatest water project in Israel is the one known as the National Water Carrier project; this is based on a well known geographical fact, which is that 95 percent of the available water reserves lie in the north of the country, where only 35 percent of the agricultural land is situated. (4)

The original National Carrier Project plan was set out by the American engineer James Hayes in his comprehensive report titled "TVA on the Jordan." Hayes drew his ideas from the famous American project known as the Tennessee Valley Authority. The basic idea of the project concerns collecting water from the Jordan River springs of higher elevations in Lake Tiberias, then piping it to an elevated area, from which it can flow to the central and southern areas of the country. (5)

Lake Tiberias is 165 square kilometers in area and has a capacity of 3 billion cubic meters. The water is pumped from its northwestern shore to a point near Ishad Kinnarot which is 256 meters above sea level. From there the water flows west in an open canal 16 kilometers long, where it is again pumped up to an elevation of 147 meters above sea level. From there, the water is transmitted through a system of massive pipes (270 centimeters in diameter) and open canals about 250 kilometers in total length which feed all the central and southern areas up to the northern Negev west of Beersheba.

## Water Resources

The basic, most important sources of water in Israel are the tributaries of the Jordan River, the al-Hasibani in Syria, the Baniyas in Lebanon, and the al-Dan in northern Palestine. America proposed a project to distribute water among the countries bordering on Jordan River on the basis of recommendations presented by Eric Johnston, the American delegate the American president assigned to study ways of distributing Jordan River water. However, the Arab countries rejected the project, prompting Israel to take over the lion's share of the Jordan water as part of the National Carrier project referred to above. Thus the Jordan River contributes about one-third of the water reserves available to Israel (see Table 12).

Table 12: Water Sources in Israel (in Millions of Cubic Meters)

Source	1949	1975	1980 (estimated)
Jordan River	150	570	600
Groundwater	200	1,150	1,000
Surplus from rivers	--	(50)	100
Sewage recycling	--	(40)	100
Seawater desalination	--	(5)	10
Total	350	1,720	1,810

S. Arlosoroff, "Water Resources Development and Management in Israel, KIDMA Volume 3, Number 10 (1977), page 5.

The major importance of groundwater is also evident from the above table; it contributes about 60 percent of Israel's total water reserve. Here a very important fact stands out: that is that more than half the volume of groundwater referred to in this table (or about 550,000 to 600,000 cubic meters /sic/ percolates into Israel from rainfall areas in the West Bank and through the groundwater zones extending from the western slopes of the West Bank to the coastal areas. This fact, as we will see subsequently, has extreme significance in practice as far as Israeli policy toward the occupied territories and Israel's permanent insistence on preserving its dominance over water resources in the occupied territories are concerned.

## Aspects of Consumption

Water has played a fundamental role in economic and developmental expansion in Israel since its establishment. The water requirements of the agricultural and

industrial sectors and consumption by the population have increased several times over since Israel was established, as appears in Table 13.

Table 13: Development of Water Consumption and Cultivated Area in Israel (Water Volumes in Millions of Cubic Meters)

	1949	Percent	1975	Percent	1980 (Estimate)	Percent
Agriculture	260	74.3	1,325	77.0	1,260	69.6
Industry	15	4.3	95	5.5	150	8.3
Consumption by the population	75	21.4	300	17.5	400	22.1
<u>/Total/</u>	350	100	1,720	100	1,810	100

(Area in Thousands of Donums)

	1949	1975	1980
Cultivated area	2,000	4,000	5,000
Irrigated area	500	1,800	2,000
Ratio of irrigated land, percent	25	45	40

Ibid, p 5

As is to be expected, agriculture has been the main consumer of water, since its share has ranged from 70 to 75 percent of total consumption. That has been reflected on irrigated land area, which has increased from 500,000 donums in 1949, that is, 25 percent of the cultivated area, to about 2 million donums in 1980, or 40 percent of the cultivated area.

#### Water Organizations in Israel\*

The use of water in Israel is governed by legislation issued in 1949 which stipulates that ownership of all water resources is to be public and under government control. By virtue of this legislation, this responsibility is conferred upon the minister of agriculture in the person of the director general of the Water Department in Israel (the water commissioner), who is to be assisted by a higher water supervisory committee known as the Water Commission. The water commissioner has been granted all organizational powers related to water, such as the power to issue permits to drill wells and determine production volumes and work conditions.

\*In preparing this section, the researcher sought the aid of the following work: "Israel's Water Policies," Uri Davis et al, Journal of Palestine Studies, Issue 34, Volume IX, Number Two, Winter 1980.

The second organization which deals with water in Israel is the Tahal company, which is also known as the Israel National Water Planning Company. It was founded in 1952 with 52 percent participation from the Israeli government, 24 percent participation from the Jewish Agency and 24 percent participation from the Jewish National Fund. This company has been given the tasks of planning and study related to water resources in Israel, with the objective of improving the capacity to exploit available resources as much as possible.

This company has exported its services to many countries in Africa and South America.

The third and most important organization in the Israeli water system is the Mekorot Company. This company was founded in 1937. The Israeli government owns 33 percent of the shares in it, the Jewish Agency 33.5 percent and the Jewish National Fund 33.5 percent. Since its establishment, this has been assigned all the executive tasks related to the exploitation of water resources, including the construction and management of all national water projects. This company's tasks were redefined and emphasized in 1964 and it was given the title of the National Water Authority.

#### Water Problems in Israel

In the course of the past 30 years, Israel has managed to achieve almost complete exploitation of all the water resources readily accessible to it. As we have seen, the bulk of these resources originate for the most part outside Israel's 1948 borders, in Lebanon, Syria, Jordan or the West Bank.

However, Israel, nonetheless, still suffers from serious water problems that arise from its expansionist structure, which has the goal of consolidating Jewish settlements inside and outside the 1949 cease fire lines. The establishment and support of settlements require the concentration of agricultural and industrial production to the maximum extent readily available economic resources will permit. It seems that the factor limiting expansion in agricultural production is not land but water. Therefore we see that there has been constant increase in the volume of water used in agriculture along with a decline in the volume of water required per donum. In another area, industrial requirements for water have increased rapidly, to the point where they have come to constitute about 8 percent of total consumption. It is expected that the volume of water needed for this purpose will increase greatly, in light of the emphasis the government is placing on the industrial sector. In addition, the population's water consumption will increase rapidly because of the horizontal expansion in the number of settlements and the constant improvement in the standard of living.

The net result of these expectations is embodied in the fact that Israel will be suffering from a great deficit in the volume of water it needs. The Mekorot Company estimated this deficit at 250 to 350 million cubic meters in the second half of the seventies. (6) In the eighties, the water commissioner estimates the anticipated deficit at 450 million cubic meters. (7)

Table 14 shows an estimate of the volumes of water required for consumption in 1985, according to the report the Israeli delegation presented to the desert

conference held in Nairobi, Kenya in September 1977. The enormous size of the anticipated deficit in the volume of water required is obvious, once we realize that the maximum water reserve available to Israel in the mid-seventies was about 1.7 billion cubic meters.

Table 14: Estimate of Water Volumes consumed in 1974 and 1975 (in millions of cubic meters)

	1974	1975
Urban Consumption and Industry	410	700-800
Agricultural Consumption	1,170	1,170
Loss and Waste	60	130
Total	1,640	2,000-2,100

Israel's report to the U.N. Conference on Desertification, August 29-September 9, 1977, Nairobi, Kenya.

The second water problem in Israel is the possibility of salt water incursion into aquifers in the central and northern areas of the country. It appeared, in the course of the seventies that there was potential encroachment by salt water fronts on the main aquifers in the Ra's al-'Ayn area and the northern plains from more than one direction. It is believed that excess pumping from these zones, in addition to the extreme rainwater deficit in some seasons, helped exacerbate this problem. Therefore the Mekorot Company resorted to injecting large amounts of surplus water into the aquifers in the central areas of the country in the rainy season in order to raise the groundwater level to a point that would prevent salt water encroachment from adjacent western zones.

#### Probable Solutions to the Water Shortage Problem in Israel

The foregoing facts show the main contradictions that govern water policy in Israel. It has used all the special resources it could, but its current and future requirements require that it look for large additional amounts of water. Here is a brief summary of the sources that have been broached to eliminate the anticipated shortage.

1. The search for new sources inside Israel's borders. We have already seen that this solution offers no new potential, since all water sources have been completely exploited.
2. Seeding clouds with silvery salts. Intensified studies were made in this area and it ultimately became evident that this method is not effective, that its results are unpredictable and that it cannot help solve Israel's water problem in a tangible manner. (8)
3. Seawater desalination through the use of atomic power. Although it is possible to think of providing potable water by this method, in the manner of the plant erected at Eilat, which supplies that town with half its water needs, the high

cost of the water produced by this method (about 30 cents per cubic meter) will make its use for agricultural production purposes impractical before the latter part of this century, in the opinion of the former director of the Water Department in Israel. (9)

4. Recycling sewage in heavily populated areas; this method is distinguished by its low cost (about 4 cents per cubic meter) but on the other hand it cannot be a source of real benefit before the end of this century, when it is estimated that the volume of water recycled from sewers will total 325 million cubic meters a year. (10) In addition, the water produced by this method leads to health complications that greatly limit the possibility for use on a broad scale.

5. Development of more efficient water use methods. This applies in particular to the agricultural sector, which consumes about 75 percent of the total volume. One will recall that sprinklers are used in irrigating 87 percent of the irrigated land, while drip pipes are used in 10 percent of the territory irrigated. (11) These methods are distinguished by very high efficiency, to the point where Israel is now using 98 percent of its exploitable water resources. (12) It has been proved that drip pipes are about one third more efficient than sprinklers. However, the process of replacing the sprinklers does not make this a solution of unquestionable value in coping with the problem of the shortage of Israel's water requirements in the eighties.

#### Basic Elements of Israeli Water Policy

One can summarize the main foundations on which Israeli water policy is based as follows:

1. Development of efficiency in the use of readily accessible water resources to the highest possible level.
2. Striving to take over new water resources outside the borders of Palestine. There has been more than one hint of Israel's real intentions regarding the waters of the al-Litani and the al-Yarmuk.
3. The effort to exploit accessible water resources in the occupied territories, especially the West Bank, as part of a general plan that is aimed at the following:
  - A. Restricting Arab citizens' water use to the narrowest framework.
  - B. Enabling the settlements to drain off the greatest amount of surplus water that can be used; Israeli experts estimate this at about 150 million cubic meters (13)
  - C. Adopting measures that will guarantee the percolation of surface water and groundwater into the coastal areas via the western slopes of the Bank, which constitute the supply source for more than half the groundwater in Israel.

#### Examples of the Policy of Restricting Water Use by Arab Citizens

Some well-informed experts believe that the Israeli government has actually decreed the imposition of a ceiling of no more than 35 million cubic meters on the amount



of water that the owners of Arab wells in the Bank are allowed to pump. Thus their total volume of consumption would be about 100 to 120 million cubic meters. To achieve this goal, the authorities have adopted a number of measures, among them the following:

1. Strictly prohibiting the drilling of new wells for agricultural purposes. One well actually has been drilled for this purpose since the beginning of the occupation, and the military government recently issued two drilling permits for the al-'Awja region after the international outcry stirred up by the issue of the desiccation of the springs and wells there through the influence of adjacent Israeli wells.

2. Restricting permits for drilling potable water wells to the narrowest framework. So far the military government has given agreement only to five wells, on behalf of the municipalities of Nabulus (two wells), Qalqiliyah, Tulkaram and Qaffin.

3. Imposing stringent prorationing on pumping from Arab wells and bringing violators to military court. We have already reviewed the manner and circumstances of this limitation. In fact, this step has, in addition to the earlier reference on the prohibition of new well drilling, helped restrict the pumping up of ground-water for Arab citizens to the volume specified above.

4. Harassing farmers in irrigated areas on "security" grounds. The authorities have adopted many steps in this field. Herewith, as follows, are samples of these:

- A. In the early part of the occupation, the authorities took the initiative of blowing up 140 pumps situated on the West Bank of the Jordan River which were used for irrigating the plantations and farms situated on the plateau strip alongside the Jordan River, which is known as the al-Aghwar area. Before the occupation, this region was one of the most fertile and important areas of vegetable output on the West Bank.

- B. Shutting down extensive areas of good farmland in the al-Aghwar, al-Buqayqah and other areas. It is estimated that more than 80,000 donums were shut down north of the Nabulus-Damiyah Road alone.

- C. Compelling a number of farmers to exchange their land for other land controlled by the absentee property custodian. Naturally many farmers rejected this offer because of the problems and complications it would cause among Arab citizens themselves; therefore they were compelled to leave their farms and move on to neighboring towns and villages.

- D. Plowing up and demolishing irrigation channels in the al-Jiftlik area in the summer of 1979 on the pretext of building a new "security belt." That caused extreme damage to the owners of plantations and farms in the area.

- E. Resisting every project that might ultimately result in increasing the quantity of water the Arab citizens use or the area of irrigated land in their possession. An example of this is the hostile policy the authorities and the media are pursuing toward ANERA (American Near East Refugees' Aid) after it agreed to finance a project to replace the al-Fari'ah earthen channel with a system of pipes. The authorities

actually did refuse to agree to the construction of this project although the technical studies the American and Arab experts carried out proved that that would result in doubling the efficiency of the use of the water transmitted through it.

F. The bad condition the settlements Palestinian farmers established hundreds of years ago on the slopes of the hills in the West Bank are to be considered a vivid example of the results of the economic policies in the Bank. The retaining walls have greatly deteriorated because of the crippling increase in workers' wages. That has resulted in the occurrence of severe erosion of topsoil in the mountain slopes and the runoff of the bulk of the rainwater into watercourses which ultimately go down into the coastal areas in Israel. The deliberate neglect of the groves in the Bank also lies within the framework of this policy; in some cases this has reached the point of combating forestry activities and abusing existing groves.

#### Examples of Israeli Exploitation of Water Resources on the Bank

The other half of basic Israeli policy on water resources in the occupied territories is the effort to exploit them in a colonialist fashion primarily aimed at realizing Israeli interests. It has been observed that successive Israeli governments have agreed on the need to strengthen their total control of water resources on the Bank, using the excuse of the need to coordinate the exploitation of these resources on behalf of "both parties." Here are some examples of Israeli measures that are gaining Israel control over the lion's share of West Bank water:

1. Israel has drilled 27 artesian wells in the Bank; these pump up about half as much water as all the Arab wells combined, which number 314. There still is an intention to drill more such wells.

2. At a time when Arab farmers have been prohibited from using Jordan River water to irrigate the al-Aghwar area, as we mentioned above, the authorities have permitted Israeli settlers in the northern Jordan Valley to pump water from the river for use in irrigating some of the crops that can tolerate a moderate salt concentration (such as grapes). It is estimated that Israel is pumping up about a million cubic meters in the framework of this project, which is known as the Jiljal water project.

With encouragement from the authorities, some settlements and military barracks obtain relatively large amounts of water from a number of the Arab springs and wells the Central Water Department supervises. This is done either by pumping through a system of pipes or by transporting water in large tank trucks.

#### Repercussions of Israeli Water Policy on the Future of the Bank

The measures Israel has taken regarding water resources on the Bank have produced results that have had a profound effect on Palestinian citizens on the West Bank. The first and most important result of Israeli water policy has been its repercussions on the agricultural sector. Although the effects of the occupation on this sector are complicated and very diverse one can in general conclude that the occupation has led to a regression in the volume of the gross agricultural output of most branches of agricultural production, going by the rate of production in the

6 years before the occupation and after it. (14) Production of grain declined 28 percent, that of vegetables 18 percent and that of cucumbers 89 percent, while fruit production increased 7 percent. Although the effects of the occupation on nonirrigated agriculture merit study and attention, especially since 96 percent of the farmland is farmed without irrigation, what interests us here is to note what has happened in the irrigated areas, especially in the Jordan Valley. The al-Aghwar, in the sixties, became one of the most important areas of agricultural production on both banks and one of the most open to rapid irrigated farming expansion. It should be pointed out that the second phase of the East al-Ghawr Canal, on which work began a few months before the occupation, entailed the laying of a major canal and a branch system on the West side of the Jordan River. This canal was to irrigate more than 30,000 donums--that is, it would increase the irrigated area by 40 percent. One can assume that the thousands of donums which the thousands of Israeli settlers are irrigating in the Jordan Valley would have been hooked up to water and farmed by Arab citizens before the end of the sixties had the occupation not occurred.

In the western coastal areas, farming has been greatly affected by the refusal to permit the drilling of new wells and the prorating of output from existing ones. Experts in agricultural circles estimate that it is possible to put no less than 30,000 donums under intensified irrigated farming if permission is granted to drill a further number of artesian wells; however, the authorities rely on the excuse that it is necessary to regulate pumping in order to protect the aquifers from salinity--thereby ignoring the real situation, which is that the threat of salinity comes from the tremendous volume the Israeli wells are pumping up on the coastal plains, not the puny Arab wells with their limited capacities. We saw earlier (Tables Three and 10) that the amount pumped from all Arab wells combined is about 37 million cubic meters, while the volume of groundwater Israel uses totals 1.15 billion cubic meters.

The backward nature of agricultural production has had great repercussions on the economic and social structure of the Bank. The agricultural sector was the main source of income for the majority of the inhabitants and the sector that absorbed most of the manpower. Now, however, many farmers and people working in occupations complementary to farming have been turned into workers in Israel and their wages now constitute the backbone of the economy of the West Bank.

Perhaps the clearest example of the effect of Israeli water policy is what happened in the areas of Bardalah and al-'Awja situated in the Jordan Valley, since what happened there is a paradigm of what will happen in all areas of the Bank with the passage of time. Therefore it is beneficial to learn the truth of what is going on in these two areas.

#### The Bardalah Case

The village of Bardalah is situated near the northern boundary of the Jordan Valley, 3 kilometers from the Israeli borders. It is inhabited by about 1,000 people from Tubas. About 3 kilometers southeast of Bardalah there is the village of 'Ayn al-Bayda', which has a population of 800.

The Bardalah-'Ayn al-Bayda' area is considered to be one of the major vegetable producing areas in the West Bank; about 5,500 donums are farmed under irrigation there. Water is obtained from artesian wells (eight in number) and springs (11 in number). The signs of change in Bardalah began to appear in 1968 when Israel established the settlement of Mahula, for which it drilled a 24-inch well that is able to pump 1,600 cubic meters an hour, as compared with 220 cubic meters in the main Arab well in the village. Naturally that resulted in a continuous, rapid drop in the groundwater level and a drop in discharge by the springs, to the point where six wells and 11 springs dried out. That led to a total drought in the citrus orchards of 'Ayn al-Bayda' and Bardalah and a great drop in vegetable production among Arab farmers.

The authorities' way of coping with the ramifications of the situation offers a vivid example of what Israel means when it talks about its desire to control water resources in the occupied territories. Following protracted negotiations and delays, the authorities agreed to supply the owners of fields who had suffered damage with water from the Israeli Mekorot Company at local production cost, provided that all absentee workers in the territories be excluded from that. Less than 2 years later, the authorities drilled a new well several meters away from the village well. The new well started producing in May 1979 at a rate of 700 cubic meters per hour. The Mekorot Company will provide Arab farmers with about 950,000 cubic meters a year, or about one quarter of its annual output. The Israeli settlers will use the rest to increase production and expand the area of settlements.

#### The al-'Awja Case

The village of al-'Awja is situated on the Jordan Valley 10 kilometers north of the city of Jericho. The population of this village came to 8,000 shortly before the occupation in June 1967. However, during and shortly after the war about 6,000 of its inhabitants departed and just 2,000 remained.

The al-'Awja area is distinguished by being one of the most important area of banana, citrus and vegetable production in the West Bank. The areas farmed in the 1978-79 season were estimated at 5,000 donums for vegetables, 1,450 donums for bananas, 250 donums for citrus, and 3,000 donums for grain. It is to be noted that the population there relies almost totally on agriculture for a living, because it is remote from the main commercial centers of the Bank and the workers also have difficulty in getting transportation to Israel.

The farmers in al-'Awja receive the necessary water for their crops from the al-'Awja spring and adjacent artesian wells. This is one of the largest springs on the West Bank, since its annual discharge is estimated at about 5.7 million cubic meters.

The problems in the village of al-'Awja began when the Israeli authorities drilled three artesian wells near the village spring. As would be expected, that led to a perceptible drop in the discharge of the spring. The situation then worsened because of the scant rainfall in the past 2 years, which caused the well to dry up altogether in spring of last year, 1979. Of course that created a real catastrophe for the farmers, resulting in the desiccation of 1,300 donums of bananas and 150

donums of citrus, the net worth of whose annual net output is estimated at \$2.7 million. Irrigated vegetable farming also declined by 2,000 donums, most of which were irrigated by the drip system. This means that tremendous amounts of capital in the form of motors, pipes and irrigation ponds were frozen and, as a result of all that, three quarters of the population left, leaving 500 who shifted from farming to being hired workers in the nearby Israeli settlements.

One of the sad discrepancies is that while the people of al-'Awja have been lacking potable water, the nearby Jewish settlers have been blessed with swimming pools and dispose of water as they like.

After many reviews with the military governor, and pressure from the local and international press, the authorities agreed to supply the village inhabitants with drinking water from an Israeli well through a pipe laid from the well to the village. However, the authorities refused to respond to the inhabitants' demands that they be given permits to drill new wells. After concentrated pressure from the international media, the authorities issued just two permits, claiming that the groundwater reserves in the region were not sufficient to supply additional wells besides the Israeli (and Arab) ones that exist now.

#### Recommendations

For 13 years the West Bank and the Gaza Strip have been staggering under an Israeli occupation that has spared no effort to mobilize all the two areas' economic resources, especially water, in an annexationist fashion, realizing Israeli economic interests first and last. The basic focal point in most economic studies related to the occupied Palestinian territories has been to set forth economic conceptions of these areas in the context of an independent Palestinian state, ignoring the fact that every day Israel creates a new state of affairs which diminishes the economic assets and activities of the proposed state and ultimately turns it into a theoretical subject devoid of real meaning. Therefore concentrated effort must be made to study economic, social and cultural sectors under current circumstances and do everything that will have the effect of strengthening the perseverance of the citizens on the West Bank and the Gaza Strip in the face of Israeli policy, which is trying to swallow up the land, drive its population out and turn those who remain into workers in Israeli factories.

In this study we will confine ourselves to highlighting a number of recommendations that are aimed at remedying water problems the citizens in the West Bank suffer from as they are staggering under the occupation. Of course it will not be easy to carry some of these recommendations out, in view of the firm Israeli control of water resources in the occupied territories. However, this just means greater determination and concern to carry out a national water policy in the transitional occupation stage.

The basic slogan of Palestinian water policy in the current transitional stage is to seek to acquire the best use of the water resources readily available to the Arab citizens and at the same time resist Israeli dominance of water resources in the political, media and legal areas.

## Recommendations on Improving Water Resource Use Capability

Agriculture absorbs about 90 percent of the total water consumption on the Bank. Therefore one must concentrate on developing irrigation methods in a manner where the farmers will be able to expand the irrigated area by as much as 80 percent while using the same amount of water. It is no secret that current irrigation methods are very wasteful of water, as we mentioned above; in addition, they require many man-hours.

The following recommendations will help raise irrigation water use capability to a large degree. However, they do not include an adequate amount of technical and economic detail. Therefore specialists must be assigned to provide further details on all of them to the Palestinian and philanthropic bodies that are concerned with financing these projects in order to adopt suitable executive measures.

1. Replacing the dirt canals as channels for water from springs and wells with pipes wherever possible. The most prominent example of that is the al-Fari'ah Canal, which the farmers who benefitted from it and the ANERA organization agreed should be replaced by pipes, although the project has not been carried out yet since the authorities have rejected it.

2. Setting out a plan to support the process of replacing traditional irrigation methods by the drip system. One must insist that this system include citrus and banana plantations.

The success of this plan will demand concentrated effort in the field, and this will require that domestic sources of financing contribute some of the costs of the system the farms will require, because this investment will have a nationwide payout as well as being an individual investment. It is possible to benefit from the experience of the Mennonite Philanthropic Society's experience in this field; this helped spread the drip irrigation system through the al-Aghwar.

3. Encouraging the construction of more dirt and cement irrigation ponds by providing needed loans on encouraging terms. Here construction and financial services must be coordinated by one or more bodies that are able to get in direct, continuous contact with the farmers who benefit, such as cooperative and philanthropic societies and town councils.

4. Assigning a team of hydrological experts to make a detailed study of well conditions on the West Bank and offering recommendations on the proposed projects to improve conditions in them. It is recommended that the team that is assigned to do the study consist of two Palestinian experts, one from the West Bank and the other a Natural Resources Authority expert in Jordan.

5. Encouraging farmers in the unirrigated areas to construct retaining walls and repair walls that have been destroyed as part of a plan to redevelop unirrigated lands that have suitable gradients, along the lines of the many projects that Jordan has established to support unirrigated farming. It is recommended that the new settlements be planted with olive and grape seedlings, which should be distributed at low prices among farmers who benefit. Naturally the first step in

these projects would be to obtain the best possible use from rainwater by erecting retaining walls and preventing the runoff of water and soil into the watercourses. It is no secret that this project cannot have an attractive economic yield at the present time. In view of the fact that it is a national investment of the first stripe, the national bodies must offer the farmers taking part in it no less than one third its estimated costs.

6. Encouraging farmers who want to benefit from the abovementioned unirrigated land reclamation project to repair the damaged gathering wells located on their territories in order to make use of the water from these wells for purposes of spraying insecticides and pesticides on the one hand and irrigating new seedlings the first season after their planting on the other.

7. It is clear that Israel has not sought and will not seek to establish any irrigation project that is aimed at benefiting from the rainwater running in the watercourses on the Bank during the winter season, because it considers this contrary to its own interests. However, the Palestinian party cannot give in to that; it must demand the construction of several earth dams in specific areas for rainwater collection and use. The first step will be to assign a team of engineering specialists to set out the necessary studies for the proposed dams. After that, domestic bodies at home and abroad should press for the execution of the proposed projects.

8. Setting out a plan to develop artesian wells, either by deepening them or by renovating the pumps used on them. It is necessary that the requisite financial and technical support be made available for this process; one can seek the aid of Water and Agricultural Guidance Department experts in studying the applications presented.

9. Providing political and material support for the towns and villages of Hebron Governorate to acquire permits to drill new wells for drinking purposes.

#### Studies, Publicity and Legal Measures

1. Assigning the Arab Agricultural Development Organization to carry out a new climatic study on the West Bank (and the Gaza Strip) and on the relationship between climate and agricultural output. One should bear in mind that this organization prepared a brief report in this regard on Palestine but it is deficient in many details because of the paucity of information available to the team assigned to prepare the study. Therefore it is proposed that some experts residing on the occupied territories, especially people engaged in university teaching, participate in the new team.

2. It is necessary to obtain on a regular basis all issues of the annual hydrological reports the Water Department of the Israeli Ministry of Agriculture issues, the annual report of the military government's Water Department, and all other similar publications, then to issue an annual water bulletin in Arabic and English relying on the information contained in these reports. It is necessary to exert the greatest possible effort to learn about particular conditions in the Arab and Israeli artesian wells located in the occupied territories. Perhaps it will be necessary to start a special file on each of these at a later time.

3. Local and international media coverage of the measures Israel is adopting to take over water resources and Arab lands on the Bank and in the Strip are inadequate. One should realize that the Western media are showing great interest in this subject; therefore it is suggested that special effort be made to convey the truth of the situation to international circles.

4. The issue of Israeli dominance of water resources on the occupied territories has not been given the legal resistance that the issue of the takeover of land has. Therefore it is suggested that special bodies be assigned to study the legal aspects of all cases in which Israel has directly or indirectly taken over Arab water then seek to raise them most forcefully locally and internationally whenever possible.

/Footnotes/

1. "Administered Territories Statistics Quarterly," Vol X, No 1-2, 1980, p 95.
2. Information gathered in the course of meetings with agricultural experts and workers.
3. MA'ARIV, 18 April 1972.
4. S. Arlosoroff, "Water Resources Development and Management in Israel," KIDMA, Vol 3, No 2, 10 (1977), p 6.
5. E. Orni and E. Erfat, "Geography of Israel," Jerusalem, Israel Universities Press, 3rd Edition, 1973, pp 447-451.
6. M. Yacobovitch, YEDIOT AHARONOT, 2 February 1973.
7. HAARETZ, 5 June 1978.
8. THE JERUSALEM POST, 31 July 1978.
9. DAVAR, 26 November 1978.
10. THE ISRAEL ECONOMIST, October 1978, p 38.
11. Ibid, pp 35-36.
12. Ibid, Jan/Feb 1977, p 6.
13. Y. Bonet and U. Blaide, "Water Resources and Their Exploitation in Judea and Samaria," p 17.
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# Guide to Wells on the West Bank

## A. Western Zones

Number of Zone	Well Number	Well Name	Annual Dis-charge Volume (Thousand Cubic Meters)	Average Annual Discharge (Lit-ers per Second)	Chlorine Concen-tration (milli-grams per Liter)
8	8220	Barqayn	51	1.6	150
8	8210	Janin	123	3.8	NA
14	4260	Barta'ah	135	4.2	82
15	15240	Ra's al-'Ayn	337	11.0	NA
15	15241	Al-'Asal	118	3.7	NA
15	15242	Qaryun	404	13.0	NA
15	15290	'Uyun Barqah	72	2.2	41
15	15248	Bayt al-Ma'	433	14.0	NA
15	15255	Zuwata	306	9.6	24
15	15243	Sharish	184	5.8	108
15	15244	Fu'ad	91	2.8	197
15	15258	Harun	167	5.3	22
15	15256	Kafr Furat	65	2.0	26
17	17295	'Ajul	33	1.0	33
17	17318	Shamiyah	45	1.4	30
17	17320	Matwah	60	1.9	37
17	17330	Dalbah and 'Ayn al-Laqtan	93	2.9	26
17	17430	'Ayn 'Arik al-Fawqah	219	4.9	23
17	17432	'Ayn 'Arik al-Tahta	131	4.1	35
17	17450	Wadi Dalab	191	6.0	26
17	17453	Harshah	66	2.1	25
18	18218	Batir	63	1.9	25
19	19225	Qanar al-Gharbi-yah	21	0.6	34

## B. Eastern Zones

39	33958	Al-Shamsiyah al-Fawqa	122	3.8	83
39	39360	Al-Bayda	190	6.0	74
39	39362	Al-Shamsiyah al-Tahta	222	7.0	74
39	39365	Al-Dayr	67	2.1	163
43	41250	'Uyun Hamam al-Milh	708	22.0	1,425
43	43225	'Ayn al-Fari'ah	4,334	137.0	51
43	43240	Dulayb	353	11.0	57
43	43250	'Uyun al-Sidrah	253	8.0	30

43	43255	Hamad and 'Ayn al-Bayda	826	26.0	32
43	43256	Al-Qudayrah	995	2.0	31
43	43258	Al-Jisr	173	5.4	32
43	43260	Al-Tabban	1,313	42.0	33
43	43270	Dafna	54	1.7	NA
43	43260	Ballatah	116	3.7	32
43	43290	Al-Subyan	180	5.6	33
43	43315	Abu Salih	103	3.2	48
43	43320	'Uyun Maskah	1,685	53.0	58
43	43340	Shibli	1,144	36.0	56
45	45250	'Uyun Fasayil	563	17.0	39
45	45350	Al-'Awja	5,646	179.0	30
45	45450	Shushah	542	17.0	32
45	45453	Al-Duyuk	4,988	158.0	31
45	45451	Al-Nuway'imah	2,200	70.0	31
46	46360	Al-Fawwar	NA	NA	31
46	46370	Al-Qalat and al-Fawwar	3,028	96.0	27
46	46380	Al-Sultan	5,805	184.0	31
48	48240	Ghazal	308	9.7	2,460
48	48245	'Uyun al-	12,039	381.0	2,118
	to 48268	Fashkhah			
48	48325	'Aytan	NA	NA	30
48	48330	Artas	18	6.9	30
48	48412	Su'ayr	22	0.7	37
Total, Eastern Zones			49,753	93.3 percent	
Total, Western Zones			3,572	6.7 percent	
Grand total			53,325	100.0 percent	

Hydrological Yearbook of Israel, Jerusalem, Ministry of Agriculture, Water Commission, 1978.

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CSO: 5000/4709

## DROUGHT KILLS CROPS, CATTLE, ECONOMY RUINED

Johannesburg THE CITIZEN in English 24 May 82 p 12

[Text]

**GABORONE.** — Botswana, striving to maintain its peaceful and modest prosperity in troubled Southern Africa, has been rudely shaken lately by acts of God and man.

It is in the midst of its biggest economic crisis since independence 16 years ago due to a slump in the world diamond market largely caused by the capriciousness of the rich.

On top of that, it was afflicted by a severe drought which has scorched arable areas, ruining crops and killing cattle, the second pillar of the economy after minerals.

Amid this adversity, some officials quietly worry about Botswana's physical position, landlocked between restless neighbours.

With Black South African refugees creating the country's first crime wave, with the war in South West Africa lapping over another border and violence in southern Zimbabwe licking at a third, one top official murmured "look at Lebanon" when he privately reviewed the situation in this traditional oasis of peace and racial harmony.

No one seriously believes that Botswana will be ravaged like Le-

banon, but there is serious concern that the region's instability will increasingly manifest itself.

Botswana is bigger than France but has a population of only 940 000, most of whom shelter in a splinter of hospitable land, lodged between South-western Zimbabwe and the north-west of south Africa. Two-thirds of Botswana is occupied by the sand-filled basin of the Kalahari Desert.

At independence in 1966 the then British protectorate of Bechuanaland was one of Africa's Cinderellas. It had five km of paved highway, a railway with no branch lines, a fledgling mining industry and poor social services.

Since then, until last year, Botswana has been an African economic miracle, its people enjoying an unbroken run of steadily improving living standards.

Growth has averaged 10 percent a year since independence, one of the fastest rates in the world. Gross domestic product grew over 20 fold since 1966.

Two years ago Botswana had an embarrassment of riches for one of the world's poorest 30 nations, with sufficient reserves for nine months' imports. The balance of trade was in robust surplus, and Ga-

borone's devoutly capitalist bankers and economists were often likened to the gnomes of Zurich.

Good health services were created to bring 90 percent of the population to within 12 km of a clinic. Ninety percent of children go to primary school, against 40 percent in 1966.

Roads were built, small industry was encouraged and mining and cattle ranching boomed.

But the constant betterment which the people had come to accept almost as a natural law, with more jobs and higher pay each year, has now slammed into a wall of recession.

In his Budget speech last February, Finance Minister, Mr Peter Mmusi, said the outlook was bleak for the near future. As exports tumbled and imports rose, he announced a wage freeze for State employees and a 20 percent cut in public spending.

This month, the Botswana currency, the Pula, was devalued by 10 percent against a basket of currencies.

The Western world's recession has slashed demand for Botswana's copper and nickel and diamonds, which account for 33 percent of the GDP and 82 percent of exports in 1980. Diamond income alone was

halved in 1981, as Western investors switched out of precious stones into high interest rates.

"The economy is not healthy. We are short of money for development and everything else. All that we saved in the good years has been consumed," Mr Mmusi said.

The vulnerability of Botswana's economy has also been underlined by the depression in South Africa caused by the gold slump.

South Africa was Botswana's biggest trading partner. Its mines employ 20 000 people, providing about half of the earnings of formally employed people in Botswana.

Indications that South African mines were cutting back on Botswana labour sent another shudder through the economy.

Officials also suspect South African motives. They are clearly concerned by the atmosphere of violence in the region and tend to point to South Africa as the source.

There was no serious crime in Botswana until

last year when 12 armed robberies occurred, police said. All but one of the robbers were caught and all were South African refugees.

In this year's drought Botswana lost 75 per cent of its staple crops of sorghum and maize. More seriously, because it is a cattle country, it might lose half a million head, about 14 per cent of the national herd.

President Quett Masire has declared an emergency and has appealed for international aid, which is beginning to flow.

Western diplomats in Gaborone give the President and his Ministers high marks for sound economic management and pragmatic politics and express confidence that Botswana will pull through its crisis. But they said a measure of luck might be needed if the West's recession continued and regional politics remained on their downward spiral.

"Another year of drought would be disastrous," said one. —

## WATER LEVEL DROPS IN VOLTA LAKE

Accra DAILY GRAPHIC in English 3 May 82 pp 1, 4

[Article by Elvis D. Aryeh]

[Text] **DRASTIC** recession has occurred in the Volta Lake, the base of the nation's hydro-electric power, bringing the present maximum retention level of flow of the lake from 276 feet to 251.60 feet above sea level.

The minimum operational level of flow for the generation of electricity is 248 feet above sea level. Any level below the minimum could result in a crisis and power supply cuts to some areas in the country.

The recession has seriously affected the multi-million-cedi Kwahu Ridge Water Project at Kotoso where the lake has drawn back many metres, thereby making it difficult for the pumping of raw water for treatment.

Other areas where the water has receded between 50 and 100 metres are Nketepa, a major fishing village, Adawso Kye-

Amanfro, Torkor, Yeji and Yapei.

At Adawso, which is the major gateway to the Afram Plains, the lake has receded to such an extent that a concrete ramp

constructed as a landing station for ferry crafts has been rendered useless.

When the Volta River Authority (VRA) office at Akosombo was contacted, the public relations officer, Mr John Osei, warned that if the recession of the lake continued, the possibility of running into trouble with the turbines in future could not be ruled out.

He explained that the draw-back of the lake was a "natural phenomenon" owing to persistent delays over the last five years, of the northern rains to replenish lost water and increase the level of flow.

Another attribute is the obvious effects of the endless Saharan drought, he indicated.

Mr Osei however, denied that irrigational activities by food crop farmers along the lake were one of the causes of the recession and said "the amount of water actually taken for irrigation purposes has very little effect".

Owing to the persistent drought which caused a near crisis, he disclosed, the VRA decided in 1978 to invite the Kaiser Engineers from abroad to conduct research on the rainfall belt but fortunately, the rains came.

Mr Osei however stated that for the past four years "we have not come anywhere near our maximum lake retention level of 276 feet above sea level".

To forestall any crisis therefore with the generation of electricity from the Akosombo dam, Mr Osei suggested that "a more serious study in respect of the rainfall pattern will have to be undertaken and steps taken to remedy the situation".

Mr Osei disagreed in reply to a question as to whether the construction of the new Kpong Hydro-Electric Project was probably one of the facts for the recession.

The Kpong Dam, he pointed out, is not fed by rain but by the water released from the Volta Dam at Akosombo.

## SOUTH AFRICA

### BRIEFS

LESOTHO WATER TO SOUTH AFRICA--Lesotho is hoping to sell two of its rivers to South Africa. The controversial plan would involve diverting the rivers to irrigate South African soil. Lesotho Prime Minister Leabua Jonathan says the project would bring his country much needed income but would also make it more dependent on South Africa. Brian Eminess reports: [begin recording] The EEC will pay half, with South Africa putting up the remaining funds. The scheme will consist of five storage dams, three hydroelectric stations and a pumping station with close to 110 km of diversion tunnels. This would entail a pumping rate of [number indistinct] cubic centimeters of water a second. Official sources have claimed that the Lesotho premier has been in close contact with his South African counterpart, and that the Pretoria government is keen for the scheme to go ahead. This is Brian Eminess in Bloemfontein, for Capital news. [Text] [MB071102 Umtata Transkei Capital Radio in English 1400 GMT 4 Jun 82]

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SWEDISH STUDY: SULFUR EMISSIONS HARMING CENTRAL EUROPE

Stockholm DAGENS NYHETER in Swedish 18 May 82 p 7

[Report by Bo B. Melander]

[Text] Corroded statues and church towers that have been ornaments to Europe for centuries are now falling down. Big forest areas are dying, plants and animal species are disappearing. In Sweden lakes are dying--and soils are becoming acidified.

"Sulfur emissions are the cause of much of this. They must be rapidly halved," researchers say in a Swedish study "Acidification Today and Tomorrow" that was released Monday [17 May].

The study is Sweden's contribution to a conference on acidification in Stockholm in June, 10 years after the UN Environmental Conference of 1972.

The study warns against allowing the damage due to sulfur emissions from power plants, industries, and heating installations to continue. Billions of kronor's worth is destroyed every year.

In the aggregate the emissions can affect the climate. Even today a haze caused by sulfur particles hangs over the Arctic.

Back in 1972 Sweden tried to convince big emissions countries such as the FRG and the United Kingdom that the acidification in Sweden was caused by emissions in those countries.

□ Forests Dying

Today the understanding of the problem is greater in Central Europe, where forests are now dying and old monuments are falling down under the pressure from corrosive acid precipitations.

The United Kingdom is still rather negative toward a restriction of sulfur emissions.

"The problem is solved there with high smokestacks," says Anders Dahlgren, minister of agriculture, who presented the report Monday.

Sweden considers that it has quite clear evidence today that sulfur emissions are doing tremendous damage and must be cut down.

Lakes in western Sweden have had the same sulfur content for 8,000 to 10,000 years, but during the postwar period they have quickly become more and more acid and in several cases died out completely.

Liming does not solve the problem; the emissions must be restricted, according to the study.

Sweden strongly emphasizes that the countries responsible for the emissions also sustain damage. It is also pointed out that heavy metals and other poisons circulate more readily in the environment when sulfur is added.

□ Only the Tip

"What we see today is probably only the tip of an iceberg of environmental problems surrounding sulfur," comments Göran Persson, chairman of the committee's group of experts.

He states that there are techniques today for desulfurization and that a reduction could come about in 10 years, a reduction to half of today's emissions.

"It would mean about a 3-percent higher oil price. But, unfortunately, such a quick solution is not a realistic prospect. The important thing is for the emissions to be gradually decreased."

It is pointed out that it is important for the emitting countries to have common guidelines and laws and for the problem to be solved jointly.

Now in June a number of experts from various parts of the world are meeting in Stockholm to discuss the problem. After that will come the hard work of interesting the politicians of Europe in measures to be taken at the conference of ministers in Geneva.

But however eager Sweden is to speed up the work on reduced emissions, the statements in the study indicate a realization that the economic obstacles are great.

"But it is the causes of acidification that must be attacked. There is no other way," the study states.

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## BELGIUM

### BELGIUM HAS WORST ECOLOGY RECORD IN EEC

Brussels LE SOIR in French 28 Apr 82 p 2

[Article by B. V.: "Belgium, 36 Times Last in Ecology"]

[Text] Belgium, paradise of the polluters? Undoubtedly, as our country is the last in the European Community in the area of ecology. INTERENVIRONNEMENT WALLONIE has just irrefutably proven the Belgian lack of goodwill through stunning figures. Eighteen European directives concerning the environment are not being implemented by Belgium. The same is true for 18 international conventions. In total, Belgium contravenes 36 international obligations relative to sea, fresh water and air pollution, to toxic and dangerous wastes and to the protection of nature.

Last February, Belgium had already been designated as the "bad student of the green class." As a matter of fact, the European Court of Justice has condemned it for non-implementation of six European directives on water protection and waste management. These directives, a kind of European law enacted unanimously by the Council of Ministers of the Ten, must imperatively be retranscribed into national legislation within a certain period of time. Which was not done by Belgium. And these 6 condemnations could well be followed by 12 other calls to order.

Among the 10 members of the EEC, Belgium has accumulated the largest number of violations. This appalling delay is all the more embarrassing as our country is currently, and until the end of June, presiding over the Council of Ministers of the Community.

### Garbage Can of EEC

In addition to our international credibility, this negligence could have serious consequences. We run the risk of becoming the garbage can for neighboring pollution because of the current legal void. INTERENVIRONNEMENT WALLONIE noted that industries in neighboring countries often come unload their wastes in our country. An example: 99 percent of organic chlorinated wastes end up in Antwerp to be incinerated at sea... The Belgian "omissions" also have negative economic effects. Unlike our neighbors, our country has never developed a program for the reprocessing of used oils, a new industrial recycling sector.

Belgium seems particularly uninterested in two areas among the international conventions. Sea pollution, specifically by hydrocarbons: we will probably have to wait for a flagrantly serious oil slick to occur before the conventions will be ratified and the implementation decrees issued. The protection of nature: neither the animal and plant species threatened with extinction, nor the wild birds retain the attention of our leaders...

#### Why Not the Regions?

"We are not asking our officials to show imagination," stated INTERENVIRONNEMENT WALLONIE, "we are only asking them to implement the existing European directions and international conventions." And the timid attempt made by Mr Firmin Aerts, secretary of state for environment, is totally inadequate. Indeed, he has confined himself to having the Council of Ministers, which met on 12 March, approve 5 European directives. But the gap to be filled is much more significant...

Finally, if the national government does not meet its obligations, it would be perfectly possible for the Walloon authorities, which have responsibility in matters of environment, to take the initiative and to transcribe the European directives into internal regional law. This is what the Flemish Council did by adopting an enabling decree relative to waste management. Thus, the regions could put themselves straight with their international obligations, while the national government would remain in violation... On the condition that there is a Walloon will to do "green" work.

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# GOVERNMENTAL ANTIPOLLUTION MEASURES DEEMED INADEQUATE

Athens EPIKAIRA in Greek No 720, 20 May 82 p 19

[Text] The reality called "Cloud" [pollution] was tough on the government last week. The implementation of the measures that the YXOP [Ministry of Urban Planning, Housing and Environment] had been working on for 6 months has not borne fruit, as is apparent from the bulletins issued by the center for antipollution. Athenians only breathed again more freely thanks to the prevailing winds.

However, this last and most serious episode of atmospheric pollution also had some "positive" aspects, in the sense that it contributed toward clearing up some confusion on the subject.

Actually, the zero effectiveness of the measures that were gradually applied proved that the government is struggling to solve a problem whose identity remains an unknown.

Thus, first of all, the measures taken against the use of private vehicles proved themselves, beyond the shadow of a doubt, totally fruitless to combat the "cloud" and only contributed to a certain traffic decongestion in the center of town.

Moreover, the restrictions imposed on some tens of industrial plants from the 13,500 that exist in the Attiki region, while on the one hand being impossible to control (as the survey conducted by the Ministry of Industry clearly confirmed), also reveal a haste which, instead of solving the problem, only diversifies it: indeed, the subject is not the restriction of industrial activities, but their correct operation in a first phase with a subsequent redistribution within the available space.

As a result of these tactics, Greek industrial units remain isolated from antipollution technology such as control of fuel, filters, etc. Their move to other less vulnerable areas remains a vague "future" in a dim velleity.

Thus, to face the problem on the basis of the "closing down"--periodic or definite--of industrial plants only forebodes an increased burden of the social costs of the pollution. And it is unthinkable to solve a problem by creating another.

## GREECE

### DRASTIC MEASURES TAKEN TO REDUCE POLLUTION

Athens TA NEA in Greek 12 May 82 pp 1, 4

/Excerpts/ Stricter measures will in all probability be put into effect tomorrow to combat pollution. Included among these measures will be the closing off of the center of Athens to private vehicles, a 40 percent cutback in fuel consumption by 71 privately-owned industries, restriction of truck traffic and a 2-hour reduction in public services personnel work schedules during the morning hours. Today, only automobiles with even-numbered tags will be permitted to circulate in the greater Athens area.

Moreover, this week, the Ministry of Urban Planning is expecting to receive an answer from industrialists to its proposal that one-third of the industries (about 1,500) close down every summer month to significantly cut down on pollution. The closing down of these industries for 1 month will be coordinated with the annual leave of the personnel. The Ministry of Urban Planning announced that if the answer is affirmative, then the measure could go into effect on 1 June. For those few industries which perhaps cannot close down, special arrangements that are now being studied will be implemented. This measure will be coordinated with the implementation of a graduated work schedule in the public services and subsequently in shops.

Yesterday, pollution affected the lives of the residents of Athens, particularly those with heart and respiratory ailments.

Many cases of fainting were recorded and out-clinics received more than the daily number of patients.

#### New Measures

The second series of special measures that "if needed will be announced in detail today" will be the following, in accordance with the government announcement of 15 January:

## Industries

- An added 10 percent reduction (total reduction by 40 percent) in production and fuel consumption by privately-owned industries.
- Suspension of work by certain categories of industries which, from their nature and location, create a serious problem and for which there are no special problems in production procedures (foundries, brick plants, lime kilns, quarries, etc.).

## Vehicles

- Prohibition of circulation of a certain number of government, public and social welfare organization vehicles.

Moreover, the hours trucks will be permitted to circulate in the "blue zone" will be only those that trucks over 4 tons are permitted, namely 2200-0630 and 1500-1700.

Also included are the following:

- Significant cutback in construction and excavating work.
- A decrease by at least 2 hours in the work schedules of personnel in the public services, NPDD /Legal Entity of Public Law/ firms, social welfare organizations, banks and other such services controlled by the state and adjustment to the desired traffic conditions.

## Public Prosecutor's Office

Those industry officers who refuse to abide by the special pollution measures or who attempt to deceive Ministry of Industry teams conducting inspections will be brought before the public prosecutor's office.

The above information was provided by the Ministry of Industry yesterday and, as was made known, a revision in the relative legislation is already being studied so that both administrative and penal sanctions might be imposed on enterprises and company officers brought before the courts.

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GREECE

BRIEFS

RAIN, HAIL PELT GREVENA--Salonica, 15 May--Bad weather has brought about a catastrophe of Biblical proportions in the Grevena Nome, where heavy rains and hail have pelted the region. Damage to agriculture has reached the 100 percent mark (wheat, tobacco and grapevines have been especially hit) in the villages of Amygdalies, Oropedion, Rodia, Elevtheron, Milea, Kivotos, Agios Georgios, Kokkinia, Vatolakkos and Taxiarkhis. The heavy rains that fell over most of the nome destroyed 250 mts of the Grevena-Kozani highway at the "Pigi Kamilas" locality near the village of Kokkinia. [Excerpt] [Athens TO VIMA in Greek 16 May 82 p 1]

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UNITED KINGDOM

BRIEFS

RESEARCH ON 'ACID RAIN' HALTED--The British government is cutting down on all research on air pollutions, and the Ministry of the Environment is discontinuing contributions to research on sulfur emissions. Outstanding British researchers are insisting that the cutbacks will make the United Kingdom's negotiating position vis-à-vis the European countries on laws against emissions difficult, according to the English scientific periodical NEW SCIENTIST. The Scandinavian countries, which assert that the United Kingdom's emissions contribute to the acidification of soil and water, will see the decision as a British no to reduced emissions. When the ministers of the environment meet in Stockholm in June on acid rain it is already expected that the United Kingdom will not promise reduced sulfur emissions. Research on the United Kingdom's traditional "smog" problem is also considerably affected by the cutbacks.  
[Text] [DAGENS NYHETER in Swedish 21 May 82 p 7] 8815

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